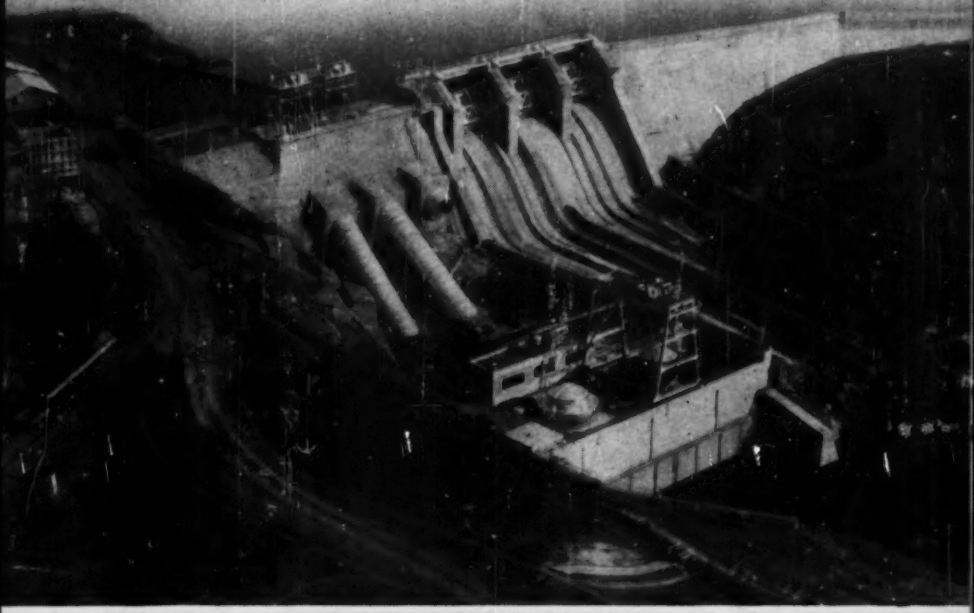
McGraw-Hill DIGEST

JANUARY 1951

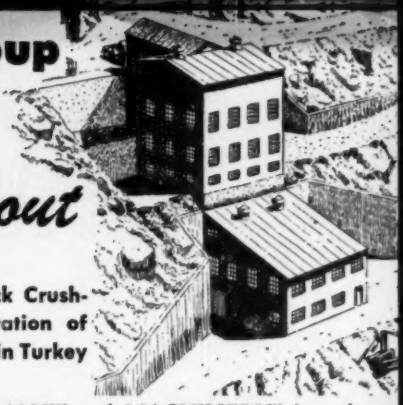
BUSINESS · ENGINEERING · INDUSTRY

How Ebasco Serves the World—p17

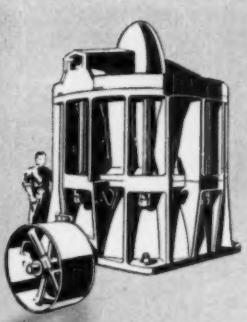


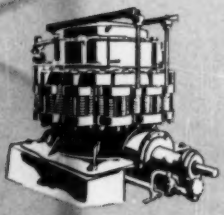
This Month's How To . . . — Page 29

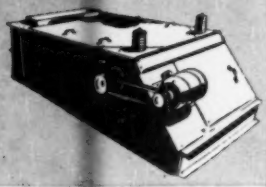
Another prominent group selects NORDBERG *throughout*



6000-Ton-Per-Day Rock Crushing Plant for Preparation of "Backfill" Aggregate in Turkey







NORDBERG "KNOW-HOW and MACHINERY" have been selected again for an essential crushing operation—this time by E.K.I., of TURKEY, the predominant Coal Mining group whose extensive workings in the Zonguldak Coal Basin are being modernized to double the annual coal output.

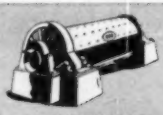
An unusual feature of this undertaking is the plant which is being provided to reduce the hazard of spontaneous combustion and black damp,—through hydraulic backfilling of the spent workings.

To assure steady flow of "back-fill" aggregate, a completely NORDBERG-equipped plant to produce 6,000 tons per day of "finely crushed hard rock" is being installed. This involves PRIMARY and SECONDARY CRUSHERS, SCREENING UNITS, a materials handling system and adequate facilities for servicing equipment. The basic units include a *Nordberg Heavy Duty Primary Gyratory Crusher, Symons Cone Crushers, and Symons Vibrating Screens.*

For large or small operations, you can depend on NORDBERG EQUIPMENT to deliver maximum output at lowest cost. *Write for detailed information.*

RAILWAY MAINTENANCE MACHINERY

GASOLINE MARINE ENGINES



PROCESSING MACHINERY

MINE HOISTS

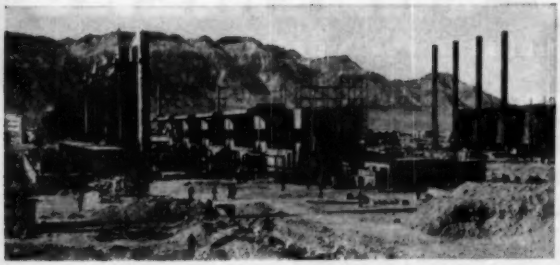
DIESEL ENGINES

NORDBERG MFG. CO., Milwaukee 7, Wis., U.S.A., CABLE ADDRESS: NORDBERG

NORDBERG THE WORLD OVER

LONDON	JOHANNESBURG	MEXICO, D.F.
Brook House, Park Lane	P.O. Box 4139	Dolores 3

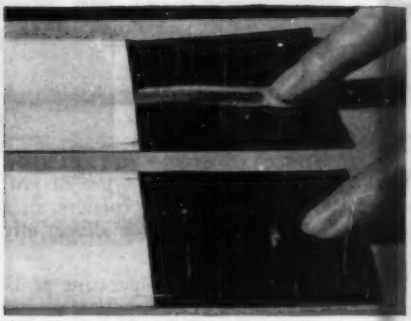
XM151



NEW FERTILIZER PLANT IN EGYPT with a capacity of 200,000 tons per year will play an important part in boosting the production of crops. The new plant is being built by Chemico, the Chemical Construction Corporation, a unit of Cyanamid. Other heavy chemical and synthetic fertilizer plants have been designed and built all over the world by Chemico engineers who are experts on purchasing, construction and engineering practices in numerous foreign countries.

Cyanamid serves industry throughout the world

TO PROTECT WORLD HEALTH, Cyanamid's Lederle Laboratories Division is constantly conducting research and developing new drugs. One of its most recent developments is Aureomycin, a golden colored antibiotic which has received world wide acclaim because of its efficacy in an unusually broad range of infections; these include acute amebiasis, pertussis infections, lymphogranuloma venereum, granuloma inguinale, typhus, acute brucellosis and numerous other bacterial and viral infections.



BETTER RUB RESISTANCE and other improvements in paper quality are made possible by Cyanamid's PAREZ® Resins. In the lower photograph note how the coating remains rub-proof on the sheet treated with PAREZ Resin 611. In the upper photograph the untreated coating on the paper is easily rubbed off. Other Cyanamid paper chemicals are available to improve scoring, folding and other characteristics that enhance the value of paper and make it easier to sell.

INFORMATION ON THESE AND OTHER CYANAMID PRODUCTS for drug, textile, leather, rubber, paper, ink, plastics, mining and other industries is available on request. Write for information or see one of our representatives.

AMERICAN Cyanamid COMPANY

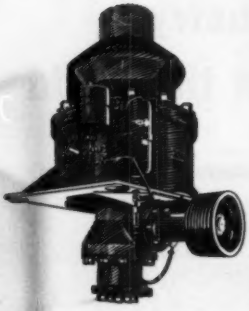
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

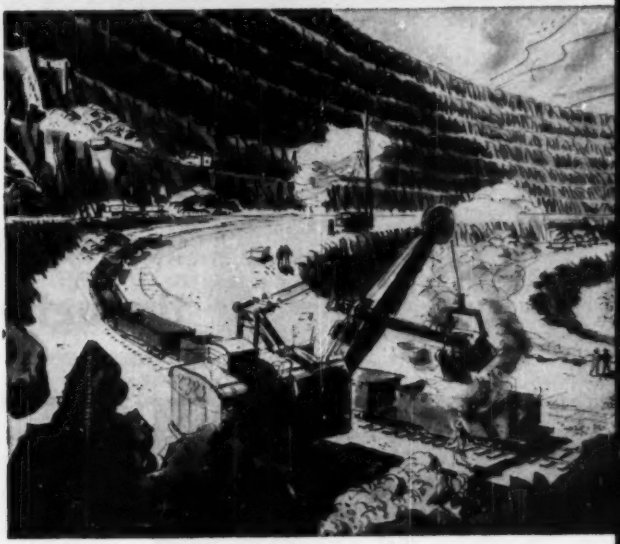
REPRESENTATIVES THROUGHOUT THE WORLD

ALLIS-CHALMERS

SERVING ALL INDUSTRY FOR MORE THAN A CENTURY

Machines for Mining and Processing Jobs!





ALLIS-CHALMERS makes all types of jaw, gyratory and roll-type crushers, in a wide variety of sizes and for almost any processing need.

Whatever your special operating problems, Allis-Chalmers can supply the *right* type and size machine for every processing step — including grinding mills, screens and sifters, furnaces and kilns, washing and handling equipment, coolers, dryers.

Allis-Chalmers also builds power equipment to drive these machines—electric motors, Texrope V-belt drives and sheaves, transformers, switchgear, and whole power generating plants.

Well-integrated Allis-Chalmers equipment working together, gives maximum dependability, smoothest continuous production, with *one undivided responsibility*.

For your equipment needs, consult our representatives in your country or write—

ALLIS-CHALMERS MANUFACTURING COMPANY
General Machinery Division,
858 South 70th St., Milwaukee 1, Wis., U. S. A.

Texrope is an Allis-Chalmers Trademark.

★ ★ BASIC MACHINERY FOR THE WORLD'S MAJOR INDUSTRIES ★ ★

Electrical Equipment

Steam and Hydraulic Turbines, Condensers

Crushing, Cement and Mining Machinery

Centrifugal Pumps, Motors and Control

Flour Mills, Wood Processing Machinery

INTERNATIONAL
McGraw-Hill DIGEST

VOLUME 6
NUMBER 1

Members—Audit Bureau of Circulations

McGraw-Hill Digest is published monthly by McGraw-Hill International Corp. for circulation in all countries of the world except the United States and Canada. Publication and executive offices, 330 West 42nd St., New York 18, N. Y., U.S.A. Curtis W. McGraw, Chairman of the Board; Willard T. Chevalier, President; Eugene P. Warner, Vice-President and General Manager; Joseph A. Gerardi, Secretary and Treasurer; John F. Chapman, Vice-President; K. Presbrey Bliss, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Director of Circulation. *Subscriptions may be ordered through Director of Circulation, through local book dealer, or McGraw-Hill, Aldwych House, London, W. C. 2 (British only).* Subscription rates: $5 for 1 year, $8 for 2 years, or $10 for 3 years; single copy 50¢ (U. S. currency). Entered as second-class matter December 17, 1947, at the post office at New York, New York, under the Act of March 3, 1879.

COPYRIGHT, 1950 by McGraw-Hill International Corp., 330 West 42nd Street, New York 18, New York. Reproduction of items in full or part without written permission prohibited in all parts of the world.

JANUARY CONTENTS

How Ebasco Serves the World 17
Gray Asks More Foreign Aid 22
Pack Plane Is Flying Box Car 25
This Month's How To 29
How to Mine Tunnels in Chalk 34
Ethoxylines: What They Are 39
Unusual Delayed-Coking Plant 46
New Juice Processing Methods 49
Belt Hauls Coal to Surface 52
New Design Wooden Freight Car 57

AVIATION
Wind Tunnel Spray System . . . 26
Helicopter Automatic Pilots . . 31
Cast Whole Airplane Wings . . 56

CHEMISTRY, METALLURGY
Coating and Lining Resins . . . 24
Makes Grease Continuously . . 30
Better Aluminum Enameling . . 48

CONSTRUCTION
Messina Strait Bridge 40
British Build Largest Dome . . . 55
Novel Spoil Removal 56

ELECTRICITY, POWER
"Inside-Out" Condenser 31
Vertical Bus Distribution 38
How to Thaw Frozen Pipes . . . 50

ELECTRONICS
Tire Tread Noise Analyzer . . . 36
Electronic Shape Recorder . . . 38
Controls Steel Quenching 41

FOOD PROCESSING
How to Spot Bruised Hams . . . 26
Milkstone Can Be Controlled . 30
Low-Cost Pie Packaging 58

MECHANICAL DESIGN
Prints on Waxed Paper 47
Oil Mist Lubricates, Cools 54
Small Vibratory Ball Mill 55

METALWORKING
New Hot-Strip Mill 26
Casting with Frozen Mercury . 31
Aircrafts Parts Stretched 51

MINING, PETROLEUM
Cyclone Recovers Values 40
Aids Borehole Maintenance . . 41
Wider Use for Hydrazine 58

PLANT MANAGEMENT
Product Design Shorts 27
Long Life from Rubber Belts . . 38
How to Find New Markets . . . 51

TEXTILES
Opener Gives Cleaner Cotton . 45
Industry's Latest Developments . 54
Carts Conveyed by Escalator . 56

TRANSPORTATION
Double-Engine Truck Drive . . . 28
Trailer Needs No Tractor 40
Ducts Help Bus Ventilation . . . 58

184 Items in This Issue

John F. Chapman *Publisher*
Harry S. Wharen *Editor*
Joseph A. Cohn *Assistant Editor*
Dexter M. Keezer *Economics Dept.*
Russell F. Anderson *Editor, World News*
George B. Bryant, Jr. *Washington Bureau*

INDUSTRIAL CHEMICALS FOR WORLD EXPORT

CERAMIC—Ceramic Colors • Uverite (Opacifier) • Antimony Oxide • Tin Oxide • Chrome Oxide Green • Cadmium Sulfide

PAINT, VARNISH, AND PLASTIC—Driers And Other Metallic Soaps • Cadmium Lithopones • Antimony Oxide • Chrome Oxide

ELECTROPLATING—Nickel Salts: Sulfate, Chloride, and Carbonate

CATALYTIC PROCESSING—Aluminum Chloride Anhydrous • Antimony Trichloride • Boron Trifluoride • Boron Fluoride Etherate • Hydrofluoric Acid • Nickel Formate

MISCELLANEOUS—Hydrofluoric Acid • Ammonium Bifluoride • Miscellaneous Fluorides • Synthetic Optical Crystals • Copper Naphthenate • Copper Oxychloride Sulfate • Cobalt Sulfate and Carbonate

WRITE FOR CATALOG
This 32-page book alphabetically lists all chemicals available and describes Harshaw's major activities.

THE HARSHAW CHEMICAL COMPANY
Export Division D **CLEVELAND 6, OHIO**
CABLE ADDRESS: HARSHAW-CLEVELAND

HARSHAW

Motor Control Centers can

LOWER YOUR PRODUCTION COSTS

Westinghouse motor control centers save time and boost production by doing away with individual monitoring of starters and breakers located at machines throughout plants or factories.

Motor starters, circuit breakers and other components are combined in a single, prewired enclosure. This improved, compact equipment makes possible easy, LOW-COST arrangement, rearrangement or addition of complete, standardized Westinghouse control units to fit any space requirements or control needs.

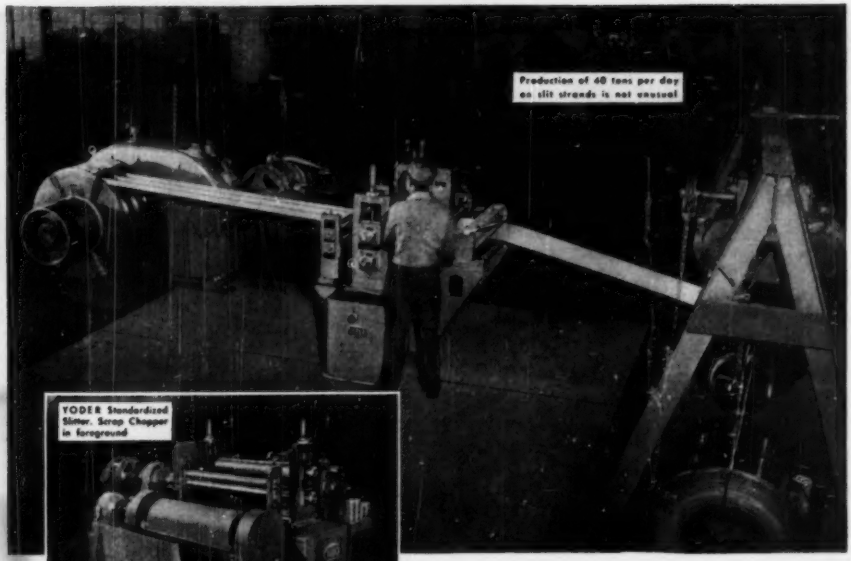
For complete information on how you can cut production costs and increase your plant efficiency, write to Dept. J for Bulletin 11-350.

WESTINGHOUSE

Westinghouse

WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY

40 Wall Street, New York 5, U. S. A.



Works only One Day a Week

... ...YET EARNS A GOOD LIVING!

Any workman who could do that—well, maybe there never was such a man, but there certainly is such a machine—the Yoder Rotary Gang Slitter for coils and sheets.

Figure it out for yourself and you will see how it may easily "earn its keep" and pay for itself in jig time, on less than 20% operation. With an experienced crew of two or three, a daily production from 20 to 140 tons is possible. With just a medium size Yoder slitting line and average size coils, forty tons per day is not at all unusual.

At the prevailing rate of one-half cent per pound for slitting service, not counting size extras, this would mean yearly earnings of about $20,800.00 working only one day per week.

Yoder standardized series of slitting line units (uncoilers, slitters, scrap choppers, recoilers) offer the greatest values for your money—in capacity, output, convenience, accuracy, and stamina. If you use, handle or sell over 1000 tons of sheet and strip per year, a Yoder slitter may not only be highly profitable, but a great convenience besides. For special needs, slitting lines built to order.

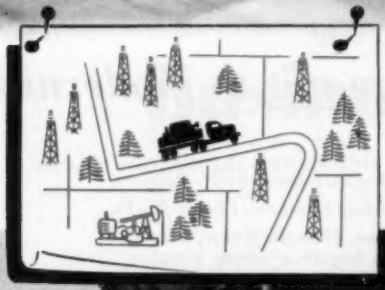
Consultations, Estimates and Recommendations. 76-page Slitter Book for the asking.

THE YODER COMPANY
5517 Walworth Ave. • Cleveland 2, Ohio

Complete Production Lines

★ COLD-ROLL-FORMING and auxiliary machinery
★ GANG SLITTING LINES for Coils and Sheets
★ PIPE and TUBE MILLS—cold forming and welding

ENGINEERING YODER MANUFACTURING



Putting ideas into action

Distance, number of trips, weight of cargo—these factors determine the size and type of truck for hauling efficiency. Turn specific transport plans into profitable action by choosing the right model from the complete International line.

For traffic or tonnage it's INTERNATIONAL!

• Whether you work in oil fields, travel busy city streets or high-speed highways, International trucks have a reputation for stamina and endurance . . . a reputation that covers every International from pickup to heavy-duty four or six-wheeler.

When loads are heavy and the going gets tough an International Truck, like the one shown here, is a likely candidate for the job. Heavy-Duty Engineered throughout . . . powered by the new International Super Red Diamond valve-in-head engine*, with electric-shift two-speed axle and optional transmission equipment. A roomy, well-ventilated cab for increased driver efficiency.

Your International Truck Distributor has the facts about every International improvement. International Harvester Export Company, 180 N. Michigan Avenue, Chicago 1, U.S.A.

Diesel engines available as optional equipment on L-150 series and larger.

INTERNATIONAL TRUCKS

Better Living through Better Roads

"*It would take courage not to modernize*"

*Says Belgian Industrialist René M. Palmers, Manager and Chief Engineer, Phenix Works, Société Anonyme, Flemalle-Haute, Belgium**

"Industry has always been a game where the most alert wins. No process can be considered perfect. Improvement in the individual's standard of living depends on the striving of all concerned for better methods and better products. This becomes more and more important for mankind as a whole and—as for any law governing social life—punishment of some sort results if it is not conscientiously followed by individuals and communities.

"Everyone in charge of a business knows how easily and quickly a healthy enterprise can tumble if it isn't equipped with first-class machinery and methods. For any conscientious management—realizing this—it would take courage NOT to modernize."

**Manufacturers of hot rolled sheets; cold rolled sheets; galvanized and lead-coated sheets; tinplate; enameled and galvanized hollow ware.*

The World Can

Take a Page from U. S. A.'s Production Book

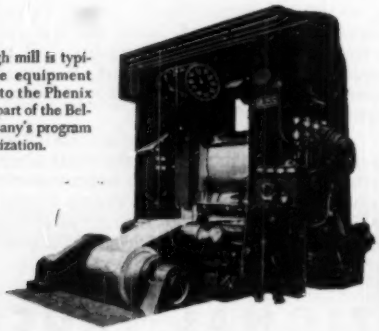
For 90 years E. W. Bliss Company has helped numerous industrial firms in every part of the world to prosper through the use of improved equipment for the rolling and forming of metal.

No other company covers the field of pressed metal with production equipment as completely as Bliss does. Bliss builds the following machinery:

1. Rolling mills and accessories for steel and non-ferrous metal industries.
2. Hydraulic and mechanical presses in a greater range of sizes than any other company.
3. Container-making machinery for volume production of any metal container, from toothpaste tubes to 55-gallon drums.

This world-wide organization, with extensive works in England, France and the U.S.A., is available for the solution of your production problems. Write to the Export Division of the E. W. Bliss Company, 19 East 47th Street, New York 17, U.S.A.

This 4-high mill is typical of the equipment supplied to the Phenix Works as part of the Belgian company's program of modernization.



BLISS BUILT

Works at:

E. W. BLISS (ENGLAND), LTD., Derby, England
E. W. BLISS CO. (PARIS), St. Ouen sur Seine, France
Canton, Toledo, Salem, Ohio; Hastings, Mich., U.S.A.

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

Exclusive World-wide Distributors for Wales-Strippit Corp., Manufacturers of the Sheet Metal Fabricator and Related Equipment

Business Trends

HEAVY INDUSTRIAL EXPANSION is making the tight U. S. economy even tighter. Industry's capital spending is running at a record rate—and it will go up again later this year.

U. S. industry plans a record expansion in 1951, when business expects to spend over $15.5-billion on new plant and equipment. That is up 10% from 1950, and it is 5% more than the all-time record—$14.8-billion in 1948. The increase is particularly heavy in manufacturing industries, which plan to spend over $8.7-billion—20% more than in 1950.

Bulk of the expansion is for purely civilian production. Improving business prospects made industry revise investment plans upward several months before the Korean invasion. Now U. S. mobilization promises good business for several years, so plans are going up again.

Add defense needs and other government plans, and 1951 totals will get even bigger. Current estimates do not allow for large-scale munitions production. Many companies would have to expand even more to fill munitions orders.

The U. S. government is pushing more expansion in basic industries. Purpose is to build enough capacity to supply civilian, export, and military needs at a high level—"guns and butter" on a grand scale.

Present U. S. capacity is considered inadequate. Steel is an example. The military got only about 4% of U. S. output through most of 1950. This year, defense and related programs will take up to 20-25%. The difference will come out of civilian production. So government is urging rapid growth in steel capacity.

The steel industry already has scheduled a vast expansion. Plans are to boost capacity about 9.4-million tons by the end of 1952. But Washington is not satisfied, may ask a 20-million ton expansion.

Aluminum capacity is growing, too. Washington wants a billion pounds more a year—and may ask for another billion pounds. Nonferrous metals, petroleum and other industries also will be expanded, and synthetic rubber plants are being reopened. Operating synthetic-rubber capacity may reach 1-million tons in 1951, compared to 650,000 tons in late 1950.

Washington is really worried about basic industrial capacity. The administration is granting tax concessions to make expansion more attractive. And if industry does not expand enough, the government itself may build the plants.

LESS U. S. GOODS IN 1951—for both domestic consumers and foreign buyers—will result from industrial expansion. Materials that could have made consumers' or export goods will go into new plants and new machinery for American factories.

Foreign importers will have more trouble getting industrial equipment. Machine

Business Trends (Continued)

tools, machinery, electrical equipment are already tight, will get scarcer as defense orders mount. Construction and conveying equipment exports are down, being held back by defense orders.

Electrical-equipment delivery dates are being pushed back by heavy U. S. demand. The defense program will be especially demanding of electrical machinery. Steel products will be cut back throughout the year. Automobile and automotive parts exports will probably drop as U. S. production falls. Farm equipment is still available, but shortages and tremendous domestic demand may cut exports this year.

Rubber is short, so exports of tires and tubes are way down. With rubber allocated in the U. S., even fewer tires will go abroad this year.

U. S. EXPORT CONTROLS will get stiffer because of growing shortages. U. S. plans export quotas for more goods. Many products already under quotas will have them cut. And more commodities will need export licenses. Anything under allocation in the U. S. may be added to the export controls list if it is exported in quantity.

But essential foreign users of U. S. products will still get exports. Washington still wants to preserve a "normal" pattern of world trade. And many U. S. companies have a special interest in maintaining their overseas markets. They will try to keep at least a trickle of their products flowing to overseas buyers.

THE DOLLAR GAP has vanished—at least for awhile. The U. S. will buy about as much as it sells in 1951. That means most dollars going overseas under U. S. aid programs will be a net gain for countries that get them.

But the gain in dollar reserves will not be evenly distributed. Canada, Latin America, and Asia will gain most. The U. S. is buying huge amounts of raw materials from those areas, will continue to take as much as they can supply. Most of these countries no longer worry about dollars or U. S. prices; their problem now is to get scarce U. S. goods.

Japan will add dollars from growing trade with Asiatic countries, whose dollar earnings are way up, and benefit further from Korean reconstruction.

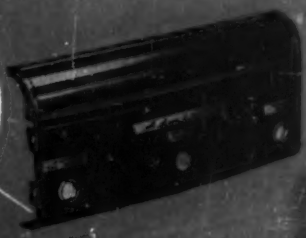
Europe will not gain so much. It could earn dollars by stepping up sales to Asia and South America. But production for European defense will cut into the quantity of European goods available for export.

British and French dollar earnings depend partly on U. S. trade policy. Both countries will lose hard goods' sales as their manufacturers convert to munitions production. But if U. S. cuts back its exports of soft goods, then Britain and France can sell more soft goods to dollar surplus areas and so keep their dollar earnings at a high level.

STYRON

THE PREFERRED PLASTIC

brings added sales appeal!



Excellent clarity of Styron brings sparkling new beauty to this radio escutcheon plate.

Styron's exceptional dimensional stability was important to this design because two mounting lugs moulded on each end of escutcheon plate had to maintain their precise size, shape and location to fit die-cast metal frame.

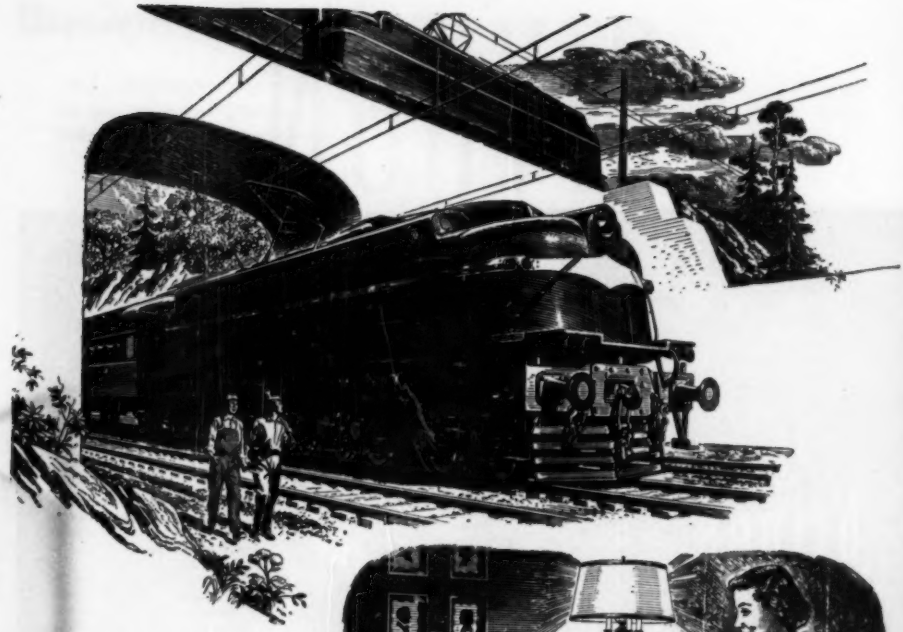
Dial holes are moulded in place thus eliminating need for expensive machining operations.

Superior rigidity of Styron allows use of economical wall sections without sacrificing strength.

Styron, chosen for the escutcheon plate on the Admiral radio, brings sparkling new beauty and a smart modern touch for added sales appeal.
And Styron (Dow polystyrene) gives the product more than outstanding sales appeal. It brings lower processing, assembling and finishing costs.
Have you considered Styron for your product? Its wide colour range, good dimensional stability, and production economies may make it ideal for your line of products. Contact Dow today and ask for the names of competent moulders.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN, U.S.A.
DOW CHEMICAL OF CANADA, LIMITED, TORONTO 1, CANADA

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE



You Benefit...

The General Electric Company has aided most countries in the development of electric power. 200,000 G-E products help improve standards in homes and industries. G-E equipment converts water power or other resources into current and many benefits follow. Typical are electric locomotives which transport people and goods speedily, efficiently—and electric clocks, radios, modern kitchen appliances for ease and convenience in homes. Place your confidence in General Electric —leader for over 50 years. A-60-1

The Standard of Excellence

THROUGHOUT THE WORLD . . .
IN INDUSTRY AND HOME

GENERAL ELECTRIC
U.S.A.

Washington Report

NEW U. S. CONGRESS will not be isolationist. Foreign economic-aid programs will get a more thorough screening then ever before. But money for defense here and abroad will be granted rather freely.

Too much defense money all at once may be more of a danger than too little. The administration has taken a calm second look at mobilization and decided a slow steady defense build-up is better than a splurge. Plans are for a yearly defense budget under $40-billion instead of the $55-billion or more you heard about right after Korea.

Fear of a big letdown caused the administration to scale down its plans. If the U. S. over-expands and then war continues to be put off, the public will balk at the huge defense price. The U. S. would be left holding a big military machine with no prospects of getting enough money to keep it going. But military men are still asking for everything possible. And Congress listens more to generals than economists these days. So the administration may get the bigger defense figure whether it wants it or **not.**

ASIA VS. EUROPE BATTLE will continue hot in the new Congress. The U. S. strategic war plan still is based on war in Europe—that is, minimum military commitments in Asia. But China-minded critics of the administration are a lot stronger now than they were last year.

A neutral China is still the State Department's objective. That means taking a lot of steps that Congress will loudly brand as appeasement—letting Red China into the United Nations, fostering trade with China. But if this policy is reversed, if the U. S. is drawn into a war on the Chinese mainland, officials are ready to say that World War III is here. That means it is time to go after the real aggressor—Russia. As we go to press, the Red Chinese are in Korea.

ECONOMIC AID to Western Europe faces a real fight in Congress. Glowing reports of rising gold reserves and falling trade deficits in Europe have convinced many legislators that it is time to stop—to re-examine the whole situation. Administration officials are full of dire predictions that rearmament will hit Western Europe's standard of living hard this summer, but Congress is likely to wait until this actually happens.

Britain will definitely be dealt out of the Marshall Plan this year, except for loans for colonial development. Only Austria, Greece, and maybe Italy will come in for another big request for relief money. Most of the other administration's requests will be for money to support the European Payments Union.

MORE THAN $1-BILLION in grants and loans will be spent by the U. S. on development programs in Asia and the Near East this year. Congress will be

Washington Report (Continued)

asked to put up half the amount in grants. The Gray report (see p22) figured Congress would have to put up $500-million each year for the next few years to finance development projects in critical areas. Places like Indo-China and Burma are in no position to qualify for loans. India also is on the list because officials doubt that it can commit future dollar earnings to pay off any loans.

World Bank and Export-Import Bank officials hope to raise their development lending to an $800-million a year total this year or next. That means doubling the current rate to countries outside the Western Hemisphere. Both banks need more lending capital. Congress will probably raise Ex-Im Bank's lending authority from $3.5-billion to $5-billion this year. World Bank plans to go into the private capital market again this spring.

Private investors can do much of the development work in Latin America—so the officials believe. But elsewhere almost all hope has vanished that private capital will make much of a contribution right now. Out of $2.4-million in direct U. S. private investments overseas in the past 3 years, only $90-million have gone outside the Western Hemisphere and into properties other than oil.

Investment guarantees for private capital going overseas is almost a dead issue for now. The administration's bill died in the last Congress, and a new one may not e submitted this year.

U. S. COMMERCIAL POLICY may be changed this year. Tariffs and import legislation are not much of an issue in boom times, so Congress may be persuaded to make some changes.

Reciprocal Trade Agreements Act will be up for renewal before July 1. The administration is asking for a 4-year renewal and a lot of amendments: (1) some modernizing of U. S. customs law; (2) authority for the U. S. to support a move turning the Geneva Agreements on Tariffs and Trade (GATT) group into a permanent organization to substitute for the proposed International Trade Organization; (3) more tariff cutting authority for the President; and (4) emergency power for the President to suspend tariffs on items in short supply.

Congress will not get around to considering them all. Look for the act to be renewed for a year or two and the President granted the right to negotiate further tariff reductions. Right now the U. S. can only reduce tariffs to 50% of prevailing rates in 1945. Most of this leeway has been used up.

ESSENTIAL U. S. EXPORTS will be kept moving this year even if the government has to issue priorities. Administration officials are solidly backing a program of keeping U. S. supplies flowing out to essential development projects and to big raw-materials producers even if shortages exist at home. But non-essential exports, particularly consumers' hard goods, are bound to slacken off under the rearmament program.

EX-CELL-O

PRECISION BORING MACHINES

Typical of the machine tools that have made the Ex-Cell-O name famous are its machines for such metal working operations as precision boring, turning and facing. The Ex-Cell-O Style 1312-A Machine shown here accommodates small and medium size parts and may be tooled for work in small lots or large volume. One or more precision spindles or boring heads can be arranged on each machine bridge. The controls of the hydraulically operated machine table can easily be set to obtain an automatic cycle which may include rapid movement, two infinitely adjustable feed rates, immediate or dwell reverse and stop in both directions of travel.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN, U.S.A. • CABLE ADDRESS: XLO DETROIT, U.S.A.

PRECISION MACHINE TOOLS • CUTTING TOOLS • MACHINES FOR MAKING PAPER BOXES AND CARTONS

Machine tools, grinding spindles, hydraulic power units, tool grinders—all these and many more Ex-Cell-O products are completely yet concisely described in Catalog No. 27281. Write for your copy. There is no charge.

EX-CELL-O CORPORATION
Detroit 32, Michigan, U.S.A.

Please send without obligation copy of Ex-Cell-O General Catalog No. 27281.

Name_____

Company_____

Address_____

City and Country_____

She travelled 4,000 miles —alone!

Not long ago, a little girl was entrusted to the care of a great air line. She flew across the ocean in a four-engined plane. For many hours she played, ate her meals and slept above the clouds. The next day she reached her destination.

Though she travelled alone, she was helped along her way— by the air line people, by fellow passengers and, yes, by the petroleum industry.

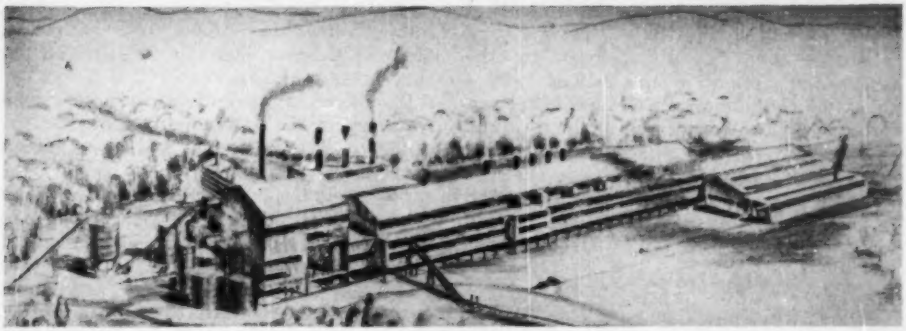
For wherever you fly along the airways of the world, your plane is serviced with fuels and lubricants made of petroleum. Esso is one of the leaders of the industry which has made these products as efficient and dependable as they are today. Because of research and constant study, tomorrow's air transportation will be even swifter, safer and more pleasant than it is now.

Petroleum helps to build a better life.

Esso

Stop at the nearest Esso Sign for Quality Petroleum Products and Service

January 1951 • McGraw-Hill DIGEST • Volume 6 Number 1



NEWSPRINT FOR INDIA will come from this National Newsprint & Paper Mills, Ltd.'s plant designed by Ebasco and being built under its supervision—another example of . . .

How Ebasco Serves the World

EDITOR'S NOTE—The United States, since the first world war, has been contributing development capital and technical assistance to many, many parts of the world. And since World War II, that help has multiplied—through grants and loans, ECA, World Bank, Export-Import Bank, and private endeavor.

Vitally important in the field of private endeavor is the work being done by engineering consulting firms, for they offer a quick, efficient means of spreading American "know-how" to the industries of the world. So to you of management who may be faced with pressing business or technical problems, we bring the story of Ebasco Services Inc. to point up clearly and simply how we believe you too can benefit from American consulting service.

WITHIN A FEW YEARS, Greece will have one of the most modern power systems in the world even though the country at present has virtually no power system. As the basic economy of any industrial nation depends on a sound power system, this giant engineering project is regarded as the first step necessary to build Greece into an industrial nation. It is being completed with ECA help.

In the fall of 1948, Ebasco Services Incorporated was engaged by ECA to survey the electric power potential of Greece and investigate the possibility of developing its irrigation system. An Ebasco engineer, assigned as manager of the project, and a market survey expert were soon on their way to Athens. Ten more specialists followed them.

Type and capacity of the system could only be determined through a knowledge of the distribution and electric-power requirements. Ebasco market researchers aided by native Greeks—because foreign nationals are used wherever practical on Ebasco's overseas jobs—made a forecast of population growth to 1957.

A study of the fuel potential of Greece disclosed major deposits of lignite, a mineral that has been used successfully as a fuel by an electric utility in Texas. So the final decision was to recommend four hydro-electric plants and one steam plant designed to burn lignite.

A year later, Ebasco submitted to ECA and the Greek government a report recommending the development of a $200-million nation-wide electric-power system

for Greece. The survey indicated that it would be inadvisable to undertake a major irrigation project in Greece at that time.

Ebasco was called in again by the Greek government in the fall of 1950—this time to manage the design, construction, and operation of the modern power system. In effect, Ebasco was hired as an operating company to develop the system and train the Greeks in its operation so that at the end of 5 years the system will be operated entirely by Greeks.

Starting from Nothing

In carrying out this contract, Ebasco had to start practically from nothing because there is no power system of consequence in Greece today. Ebasco has sent accountants to Greece to set up the accounting system, rate experts to set up the rate structure, and specialists in such fields as sales and marketing, safety, and purchasing the rights of way for transmission lines.

Ebasco's beginnings go back to 1905, when it was set up as a service organization to do special management and engineering work for the utility properties of Electric Bond & Share Corp.

Today it is one of the largest firms in the world rendering engineering, construction, and business consulting services to governments, industrial companies, and public utilities. The firm, equipped to handle engineering and construction assignments any place in the world, has a specialized staff of more than 1,500 employees.

The staff of Ebasco is divided into three sections—*engineering*, *financial*, and *operating*. Engineering includes consulting, design and construction, appraisal, purchasing, traffic, and inspection. The financial section is divided into corporate finance, rates and prices, systems and methods, taxes and insurance. Included in the activities of the operating department are sales and marketing, industrial relations, general consultation, and research.

Clients served by Ebasco are of many types. Included are airlines, chemical, exporting, food, garment manufacturers, lumber, machine tools, oil, railroads, steamship lines, wire and cable manufacturers, and mining.

The firm is recognized as one of the foremost in the power field. Ebasco's engineers have designed and constructed over 8-million kw. of new generating capacity and in the past 5 years have been responsible for nearly a fifth of the total of the current expansion program in the public utility industry. They pioneered in developing outdoor and semi-outdoor steam-electric stations.

Ebasco specializes too in pulp and paper engineering. When the National Newsprint & Paper Mills, Ltd., of India decided to produce newsprint in India, it called in Ebasco engineers for aid in the project. India has no newsprint mills, and the purchase of newsprint in the outside market has been a constant drain on the Indian economy.

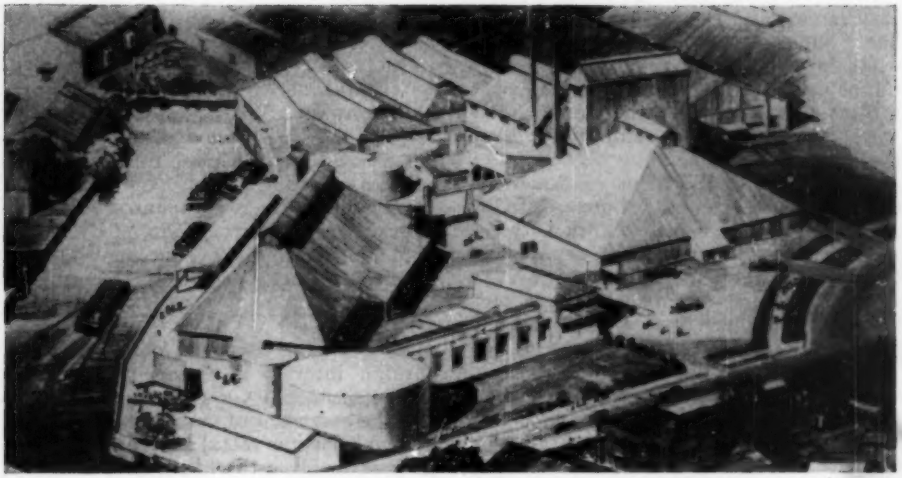
Bamboo and salai—a native Indian soft wood unsuitable for lumber—were believed suitable for pulp. So wood samples were brought to America where Ebasco experts developed the proper blend of the two pulps and actually manufactured paper with the blend for testing purposes.

Design by Ebasco

The mill was designed by Ebasco. At present, its engineers are supervising construction and purchasing equipment, and will assist in the early stages of operation until the Indians are properly trained and ready to take over.

With millions of dollars worth of equipment and material being used each month by Ebasco engineers around the world, procurement is a major function. Ebasco's purchasing department is a service department for the firm's projects.

FRONT COVER—This hydro-electric development—another Ebasco job—is for Cia. Forca e Luz Carioba in Sao Paulo, Brazil



COCONUT-OIL PLANT *for the Philippine Islands, when built for the Philippine Refining Co., turned out to be a job that demanded expert expediting to ship on time*

It also buys for individual clients that are not equipped to find the highly specialized materials they might require or to select the best for their particular requirements. The department has purchased more than $300-million worth of materials and equipment since 1945—$50-million worth in the past 3 months.

One particular assignment in 1948 is typical of the thoroughness with which the purchasing department goes about a job. The company was building a coconut-oil mill for the Philippine Refining Co., Inc., and was adhering to a rigid schedule to get the plant in operation as soon as possible.

A key requirement for completion was an order for four 1,000-kva. transformers. A survey of the major manufacturers indicated they could not be delivered within 12 months. Purchasing personnel finally located a small New England manufacturer who would deliver the transformers in 5 months but was unable to finance the purchase of the necessary materials.

Ebasco overcame this difficulty but later was informed that the order was being held up because of the scarcity of certain materials. Purchasing again went to work, located the materials in New York City and St. Louis, and arranged shipment to New England by truck.

When an order is placed with a manufacturer, Ebasco buyers do not sit back and wait for delivery. Periodic checks are made at the individual factories by Ebasco inspectors, and these checks even extend down to the suppliers of the manufacturer. A wire being manufactured in Detroit to go into a transformer being made in Boston for an Ebasco job in Brazil will probably be inspected several times in Detroit and Boston before the transformer is completed.

When the transformers for the Philippine Refining Co. were completed in New England, the time schedule was so short that Ebasco's traffic department constantly checked the rail shipment from the time it left the plant until it arrived in San Francisco. So a breakdown of the freight car in Mechanicville, New York, caused only a 8-hr. delay.

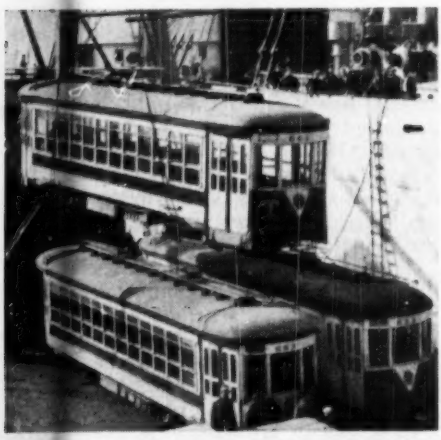
Trains were held along the way to wait

for the car, and the shipment arrived in San Fancisco on the seventh morning of what is normally a 12- to 13-day trip. Slight damage in transit, detected at the port, was repaired, and the transformers were loaded aboard a ship that sailed that same afternoon.

Twenty-five of the street cars now operating in the streets of Bombay, India, plied the byways of New York City before Ebasco's purchasing department bought them for Bombay's transit system in 1948. The retired trolleys were purchased from the Third Avenue Transit Corporation, loaded aboard ships in New York, and sent to India.

Ebasco's contract was completed when the cars were aboard the ship, but it was called on again when the first ship reached India. Unloading trolley cars with a minimum of damage proved a difficult task for the dockworkers at the foreign port, and a hurry call was sent to Ebasco for instructions.

A book of pictures taken at the loading, plus detailed captions explaining each step, were air-mailed to India in time to help in the unloading. A newsreel of the whole operation that had been taken by a television station at the time of departure was also included. The dockworkers merely had to reverse the procedure in order to unload the cars.



BOUND FOR BOMBAY, these street cars straight from the streets of New York City presented some tricky loading and unloading problems

Procurement operations are not confined to the U. S. alone. The purchasing department keeps a close check on world sources of supply; if an item of acceptable quality can be purchased advantageously from a foreign supplier, the department is able to handle all details required to make such a purchase.

More Interest in Corrosion

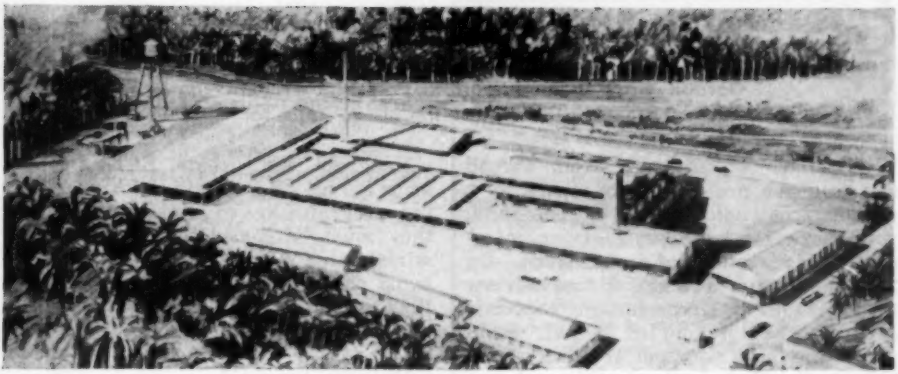
Ebasco engineers have noted increased foreign interest in recent years in cathodic protection—a method of preventing the corrosion of certain underground and underwater metal installations. The process involves the application of direct current through the soil or water to counteract the galvanic currents that normally cause the corrosion.

The U. S. Navy called on Ebasco engineers during World War II to stop corrosion on essential underground pipe lines in the Canal Zone. In a matter of months, the complete fueling system comprising four large pipe lines reaching from the Pacific to the Atlantic, plus buried tanks and associated water lines and cable sheaths, were protected against corrosion.

Trouble in Caracas

In Caracas, Venezuela, Ebasco's corrosion specialists were called in to investigate serious failures of electric and communications cables caused by electrolysis in the cables. Within 2 months, one engineer conducted preliminary investigations, designed the necessary electrolysis drainage system, supervised the installation, and made the complete final adjustments and tests.

There are no set rules about what part of a project Ebasco will do or how they will operate. In one case, a British firm found after World War II that its plant in the Philippines had been bombarded into 5,000 tons of scrap. A new plant had to be built.



COCONUTS ARE PROCESSED in this modern, post-war Ebasco-designed plant that General Foods Corp. operates at San Pablo, Philippine Islands, in place of its old war-damaged plant

The firm sent one of its engineers from England to New York to discuss with Ebasco the rebuilding of the plant. After the initial conferences, the engineer returned to Britain and Ebasco took over the entire designing and building operations.

In the case of an American company with a similar problem in the Philippines after World War II, Ebasco engineers were called in to consult with the company's engineers. The two groups worked side by side from the same office to rebuild the company's plant. It is not unusual for large firms with engineering staffs of their own to call in Ebasco on engineering problems of a highly specialized nature or on projects of such magnitude as to overtax the firm's own staff.

An example is the development of packaged power plants by Westinghouse Electric Co. for installation in many parts of the world. Actual design of the power plants was done by Ebasco engineers. These units have proved successful in installations under many varying conditions. They have been found to be easy to install, easy to use.

The Creole Petroleum Co. engaged Ebasco to study the possible expansion of the company's facilities in the Lake Maracaibo area of Venezuela for the purpose of increasing effectiveness and reducing cost to operators. The extensive survey included recommendations for increased docking facilities, changes in methods of materials handling, changes in methods of storage and records of storage, rearrangement of repair facilities, and a special method of coating the bottoms of barges on Lake Maracaibo. Ebasco even planned a city, complete with street layouts and all the needed facilities, to be built in a spot where only jungle stood.

Another project in South America has Ebasco designing and constructing the Paucartambo Hydro-Electric Development including transmission lines and substations for the Cerro de Pasco Copper Corporation in Peru. The total construction cost of the project is estimated at $15-million.

Ebasco engineers also are reviewing in Japan the presently authorized hydro-electric development program to help improve that country's power system. In this case, the client is the Japanese Generation and Transmission Co. This power study follows closely the one that Ebasco made for the government of Siam on the hydro-electric power potential of that country.

Gray Asks More Foreign Aid

Gordon Gray in his report to President Truman charts a long-range foreign economic policy for the U. S., calls for continued foreign aid

LOOKING AT WASHINGTON from abroad last fall, you probably were struck by a puzzling contradiction. On the one hand, you heard the off-year elections interpreted as a return of isolationism. On the other hand, a White House adviser recommended a U. S. foreign economic program that, if adopted in full, would please the most skeptical Westerner who looks to the U. S. for leadership and support.

As is so often the case, your fears are likely to be unfounded and your fond hopes will not be fully realized. The elections did not revive the ghost of isolationism. And the suggestions of Presidential Advisor Gordon Gray will not all be adopted by any means—at least not right away.

The new Congress will face some of Gray's most important recommendations early this session. First will come the recommendation for further economic aid to Western Europe. The Gray report urged that ECA be kept going another 3 or 4 years.

About the Gray Report from the Philippines

A delegate to the United Nations from the Philippines, Adriano R. Garcia, had this to say about the Gray report in a UN Economic and Financial Committee meeting: ". . . (its) realistic (tone) should do much to bolster the morale of peoples in many parts of Western Europe and the underdeveloped areas. The general policy of permitting United States loans to be spent outside as well as within the United States, as proposed in the report, should serve as a powerful stimulus toward an increase in the dollar-earning and dollar-producing capacity of the less developed countries".

Congress will debate ECA aid and arms aid at the same time this year. The two programs are so interdependent that they must be considered together. Administration officials will do their best to avoid the impression that the Marshall Plan is now strictly a rearmament program. They know that would remove much of the goodwill built up among Europeans for ECA.

Defense Comes First

Congress is defense-minded. Unless the legislators can see how economic aid is essential to defense, they are not likely to vote the money.

But there will be a big fight. The administration is arguing an unpopular policy: Western Europe must keep exporting even if it means cutting U. S. exports and providing Western Europe with a big share of the military end items needed for its own defense.

The administration thinks these painful facts must be faced if the recovery generated by the Marshall Plan is to last. Too much diversion of production to defense in Europe could mean that a new Marshall Plan would be needed once rearmament has been achieved.

Congress has already shown signs that it will object to any arms-aid outlay that would limit the rate at which U. S. forces can be expanded. Many legislators have also pointed to glowing reports of rising gold reserves and dwindling dollar gaps in Europe to justify their claims that the time for economic aid is passed.

Administration economists have been full of dire predictions that rearmament will lower the Western European standard of living this spring or summer. But until this proves to be true, Congress is likely to be skeptical.

The Administration will probably cut

drastically its request for ECA aid, possibly down to $1-billion as against $2.5-billion last year. And some of last year's appropriation—maybe as much as $500-million—will not have been spent as of the end of the fiscal year this July. Up to half of the total request will probably be earmarked to support the European Payments Union. These features are most likely to persuade Congress to go along—at least for another year.

Grant aid to underdeveloped areas—another feature of the Gray report—also will get a Congressional test this session. The administration will ask $90-million this year to finance small technical assistance projects under Point Four. The State Dept. also has a large development program being planned for South Asia—India, Iran, Pakistan, and other countries. State wanted to ask $500-million a year for 5 years for this project alone, but this has been scaled down.

Recommended—All Aid to ECA

Congressional opposition to aid of this type will center largely on the legislators' traditional distrust of the State Dept.'s ability to spend money wisely. Administration officials are working on a program to shift all foreign-aid operations to ECA. This was probably *the most important specific recommendation* of the Gray report. If this program is put into operation in time, Congress is likely to treat aid to underdeveloped areas a lot more charitably.

By and large, Congress has been sold on the need for fighting Communism by raising the living standard in critical areas of the Far East and the Middle East. The idea of turning Korea into a veritable garden spot as a living example to the communist world of what Western friendship can do caught the imagination of many legislators. But, again, Congress will be preoccupied with spending money for guns; other expenses are bound to be screened carefully.

Moreover, Congress will be cool to some of the development policy suggestions of the Gray report. Most important of these is the idea of untying U. S. grant and loan money—that is, removing all stipulations that the money be spent for U. S. exports.

The Gray committee argued that such a step is only logical for a country that preaches freer world trade. Competition for the business generated by U. S. aid dollars would help bring Western Europe's industrial costs down and inject more competition into the market places the world over.

Gray's staff had particularly harsh words for U. S. shipping policy; the report recommends the end of cargo preferences in favor, if necessary, of a direct subsidy to ship operators. The North Atlantic Pact nations are currently working out the requirements of a defense merchant marine. If a solution is ever found, Washington might start looking into U. S. shipping policy.

The idea of reserving half or more of the shipping business generated by foreign-aid programs for U. S. flag ships has spread to other nations. So the U. S. will not give up cargo preferences unilaterally. But some revisions may be made.

Congress will not like either of these suggestions. Tying aid dollars to U. S. exports, particularly farm exports, has

About the Gray Report from the Near East

Dr. Alfred Bonne, a delegate from Israel to the United Nations, noted while speaking on unemployment in an Economic and Financial Committee meeting that "It is certainly an encouraging coincidence that there has just been issued the Gray report, one of whose principal objectives is to prevent the recurrence of unemployment in this country and elsewhere. Among the bold and concrete proposals contained in this document is the recommendation to increase the flow of investment capital into underdeveloped areas".

won many votes in Congress for the administration's foreign-aid programs. It will be extremely hard to convince many legislators that U. S. exports would still benefit from foreign-aid programs, even without the strings.

Export-Import Bank Capital

One thing Congress is likely to do to step up development programs is to increase the lending authority of the Export-Import Bank from $3.5-billion to $5-billion. Gray hoped that the Ex-Im and World Banks would provide a net annual outflow of up to $800-million before long. That is a big jump over current operations. In 1950 the net outflow from the two banks was only $144-million, even through $426-million in new loans were authorized.

The Reciprocal Trade Agreements Act is up for renewal this session and will involve debate on a whole list of controversial commercial policy items. The administration, again following the advice of the Gray report, will ask for a 4-year renewal plus important amendments (see p14).

As tariffs are not much of an issue in the U. S. in boom times like the present, the Reciprocal Trade Agreements Act will likely be renewed for a year or two at least. The amendments stand less of a chance of being accepted.

Other commercial-policy legislation—like the reform bill for U. S. customs practices, which died in the last Congress—stands little chance of being considered by Congress in the hectic defense-legislation bustle.

Coating and Lining Resins

Four new resins for surface coatings exhibit chemical resistance, adhesion, and flexibility. Known as Epon resins, they are made from epichlorhydrin, acetone, and phenol by Shell Chemical Co. in a new Houston plant.

The resins are a new class of condensation polymer with ether linkages between carbons and relatively wide distances between the functional groups. Actually, they are resinous polyhydric alcohols.

The ether bond is responsible for the chemical inertness. General Motors Inland Mfg. Div. operated an anodizing tank coated with Epon for 16 continuous months. The coating held up against 25% H_2SO_4 at temperatures as high as 210° F.—Chem Eng, Nov, p192

The "Productigraph"—What It Is, How It Works

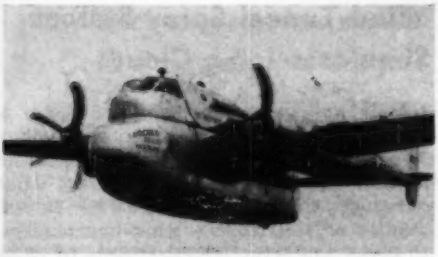
The Productigraph is a circular chart placed around the face of a clock. Removing the minute hand and extending the hour hand give a sweep indicator that cuts across the face of the chart.

The chart is made up of concentric circles. Each circle indicates the activity of one operator working on the charted job. Next, the circles are divided into segments of 5 minutes each. Filling in the minute-by-minute sequence of operations to be performed by each operator is all that remains.

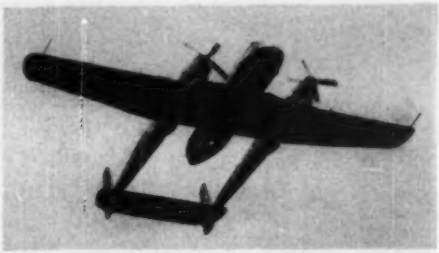
Before the chart is set up, a time study for each operation must be made. In each circle, segments are scaled off to correspond to the standard time for the operations as they performed.

The Productigraph is mounted around the clock face in such a way that the start of the shift on the chart corresponds to the actual or clock time at the start of the shift. Then, as the hour hand moves around the clock, it shows what each operator should be doing at a given time.

This makes it possible for the supervisor to check—at a single glance—the detailed progress of a line. When a delay takes place, he gets a warning almost immediately and little time is lost in getting the line back in operation. And a glance at the Productigraph will tell the operator if he is falling behind to the point where other operators may be delayed.—Factory, Nov, p78



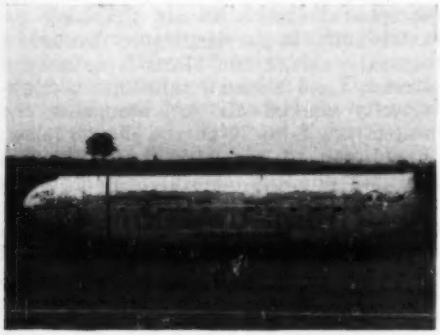
WITH PACK, the Fairchild Engine & Airplane Corp.'s cargo carrier is a "flying box car" designed for high-utility service.



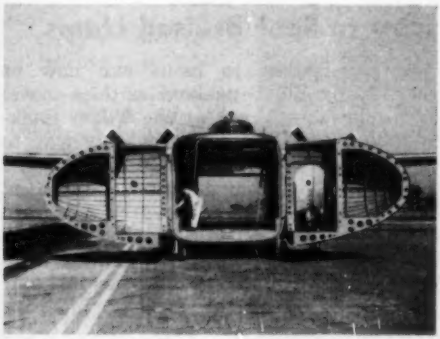
WITHOUT PACK, the new Pack Plane shows its unusual shape. Each engine delivers 3,250 hp. Maximum speed is 250 mph.

Pack Plane Is Flying Box Car

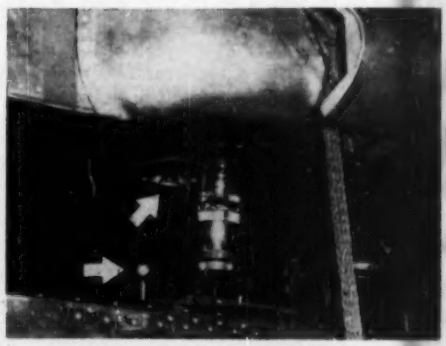
The XC-120 represents the latest step in air-freight carrier design using the box-car configuration. It consists of a carrier with detachable fuselage (pack) arrangement. The new model is a larger, heavier craft with more cargo volume and greater speed than its predecessors. Design eliminates tying up craft for a considerable period.—Aviation Wk, Nov 13, p22



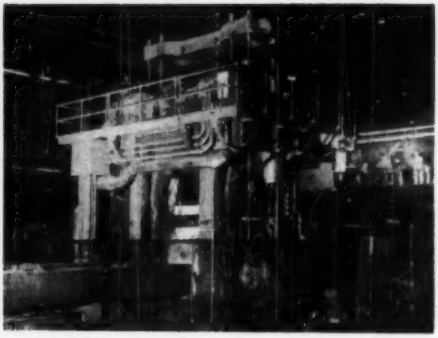
LONG PACK is nearly 56 ft. over-all, about 37 ft. between hinged clamshells. Wheels detach easily. Cargo pack volume is 2,700 cu. ft.



SPACIOUS cargohold has hinged clamshells that give easy fore-and-aft loading. Space is rectangular, unobstructed to carry bulky units.



HOOKUP between carrier and pack is by orange-peel and ball fittings (arrows). Also shown is hoist cable. Pack may be dropped in flight.



BLOOMING MILL, which can reverse in less than 1½ sec., is one of the fastest in use

Hot-Strip Mill Boasts Single Conversion of Ingot

New hot-strip mill at McLouth Steel Corp.'s Trenton, Mich., plant features single conversion of ingot into strip. After the ingots come from the soaking pit, finished steel is produced without reheating. Ingots range from 14,500 lb. to 24,000 lb. in weight.

Heated ingots are fed into a 40-in. Continental reversing blooming mill, which reduces them to plate either ⅜ or ¾ in. thick. Rolls have three box passes 4, 6, and 12 in. and a 56-in. bull head. Width is 24-40 in.

The bloomer is one of the fastest in operation. It has a twin motor drive and no pinion stand. Each roll is driven by a 3,000-hp. motor.

The mill is capable of rolling one ingot every 5 min. It can reverse a 10-ton slab in less than 1½ sec. Much of the hot-strip mill's success is due to its modern electrical controls.

Plate from the bloomer is threaded into a Mesta four-high, single-stand, reversing hot mill. Rolling starts at 1850° F. Five passes are made, the mill being reversed four times, to reduce the plate to 0.062-0.250 in. as desired.—Iron Age, Oct 26, p67

Wind-Tunnel Spray System Simulates Icing Clouds

Icing clouds are being made to order in a U. S. National Advisory Committee for Aeronautics wind tunnel to eliminate the hazard and expense of gathering icing data by flight research. The tunnel studies will determine icing characteristics and protection requirements of components of all-weather aircraft under controlled conditions simulating natural phenomena.

Nozzles were an initial problem. The accepted design is an air atomizing coaxial unit. It carries water through a central passage and ejects it as a solid stream from a small tube into a high-velocity coaxial air jet, atomizing the water into 5- to 70-micron dia. droplets. Regulation of air and water pressure controls quantity of water and droplet size to achieve natural icing conditions.

The nozzles are placed on six struts installed horizontally across the wind tunnel. An inner tube in each strut, supplying water to the nozzles, is surrounded by a space for carrying the air.

System controls are housed in small airfoil sections at the strut ends, with remote operation from the tunnel's main control room.—Aviation Wk, Nov 13, p39

How to Spot Bruised Hams

Internal bruises in hams can now be spotted by meat packers with a novel technique discovered at the Tobin Packing Co., Inc. Previously the only way to detect such bruises was to cut a suspected ham. But that meant that the cut ham, if not bruised, had to be processed into boiled ham instead of a smoked product.

Now bruises are easily detected by examining a lymph gland—the internal illiac—located at the interior juncture of the ham and the pork loin. If the gland is blood-red throughout instead of white, the ham is bruised.—Food Ind, Nov, p46

New Techniques Now Added to Cold Pressure Welding

New types of cold welds have been developed that overcome previous limitations of the process (McG-H Digest, Apr, p33). Koldwell Corp. has now announced a technique, called trap welding, that permits the welding of inserts into similar or dissimilar nonferrous metals.

In trap welding, the metal literally flows around the insert. This is the equivalent of plastic molding without the application of heat.

Tests on a steel 10-32 thread screw stud-welded into an aluminum sheet resulted in the stud breaking outside the weld at slightly over 1,500 lb. The welded joint showed distortion but did not break. It remained air-tight and moisture-proof throughout the test.

Other new types of welds include stagger welds and sandwich welds. Stagger welds are suitable for welding thin metal sheets to heavy bar stock. Dots or short straight-line welds are made along two or more parallel lines.

Sandwich welds overcome the objection to indentations in the work surface. A third piece of metal is placed between the two workpieces, and all three are welded in one operation. The sandwich piece flattens out, producing a strong weld area without indentations on either side.—Iron Age, Oct 26, p58

Product Design Shorts

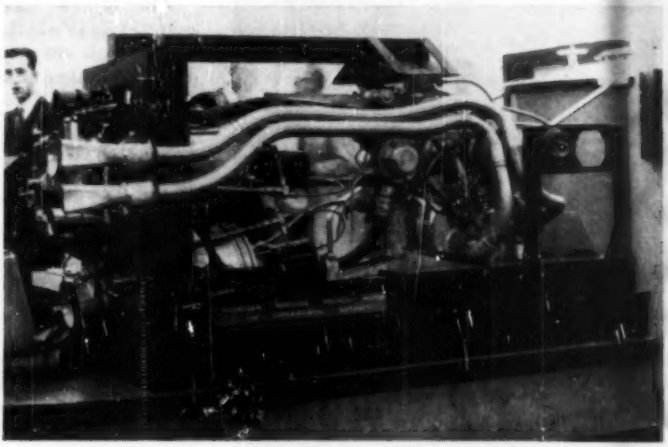
Design engineers are continually looking for new ideas. Can you apply these in your plant?

▶ Fish-oil-base primer penetrates metal surfaces to form a low-cost protective coating that is water- and air-resistant and also elastic. Finish enamels can be sprayed over it.

▶ Self-powered control for gas heating units needs no source of electrical energy other than the current generated by the pilot flame. Current powers the control's thermostat and the gas regulator valve.

▶ Only two coats of lacquer instead of customary three are needed to finish sheet-metal assemblies, such as automobile bodies and refrigerators. Trick is to apply lacquer at 160° F., permitting solid-content increase of 50-60%.

▶ You can now get fluorocarbon plastics tubing form. Two types are available—one good for 300-390° F., the other for 390-480° F.—Prod Eng, Nov, p5



LATEST BRITISH ROCKET MOTOR

Hydrogen peroxide is the oxidizer for the unstated fuel in this rocket. Movable cylinders control pitch and yaw. The two motor cylinders are at the left. Flattened pipe sections are turbine exhaust lines. Hydrogen peroxide also generates steam to drive the turbine.—Aviation Wk, Oct 9, p30

Salt Can Now Be Produced in Triple-Effect Evaporator

Calandria pans long have been considered the only vacuum pans that would give the right grain size for salt. But Michigan Chemical Co. is now successfully operating forced-circulation vacuum pans.

The latter type is more desirable because of equipment size, heat transfer, accessibility for maintenance of exchanger tubes, and more uniform flow through the heat exchangers. Furthermore, much of the small grain salt ("flour") has been eliminated, less steam is required per ton of salt, and production capacity is materially increased.

The evaporator is a triple-effect type with outside heat exchangers. Well brine is treated to remove hydrogen sulphide and manganese, then pumped through heat exchanger to the third effect.

It circulates through a steam chest and back into vapor body; then a part is passed through a salt settler. Salt is removed in the settler and pumped to a salt slurry tank, from which it runs to a vacuum filter.

Overflow from the slurry tank goes to the second-effect pan where further concentration takes place. Salt again is pumped to the slurry tank, and brine from the top of the second salt settler is fed to the first effect. Again salt is removed and pumped to the slurry tank. Remaining bittern is drawn off for further processing to produce bromine, magnesium hydroxide, and calcium chloride. —Chem Eng, Nov, p156

USE BOX PALLETS FOR SHELVING

Easy-to-make box pallets replace permanent shelving in a Sharp & Dohme warehouse. The open-front box skeleton is integral with a two-way pallet. Small items not packed to withstand weight or special items, such as rolls of gummed tape, can be packed in the pallets and stacked high, using full air rights. Because the pallets can be moved easily, storage is flexible. Most-needed items can be kept most accessible, then moved to slow-stock areas when demands change.—Factory, Nov, p93

Double-Engine Truck Drive

When Euclid Road Machinery Co. put two 190-hp. General Motors diesel engines in its model FFD dump truck, the two power sources raised a problem of power division and synchronization. So a torque converter was incorporated with each engine, and two Allison Torqumatic transmissions and two rear axles were installed.

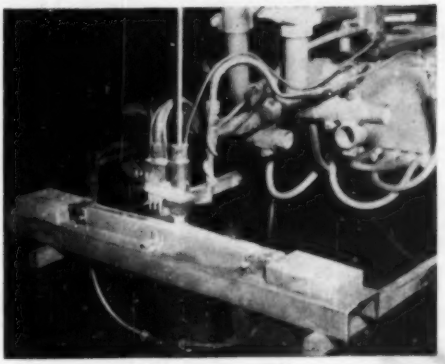
The rear axles are of the double-reduction type with single-reduction differential. Final reduction in each wheel consists of floating planetary gearing.

The truck has no clutch pedal or manual gear shift. Gears can be changed under full power at any speed. Hydraulic booster steering gives easy control of the truck.—Prod Eng, Nov, p96

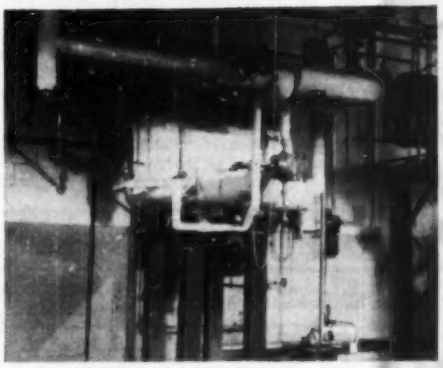
Basic-Lined Cupolas

Possibility that basic-lined cupolas will play an important part in future production of nodular iron was indicated by experimental work done at American Cast Iron Pipe Co. with magnesite brick refractory. Adding calcium carbide flux has aided production of the low-sulphur, low-phosphorous irons desired for nodular treatment. The carbide also increased temperature and carbon pickup. —Foundry, Nov, p156

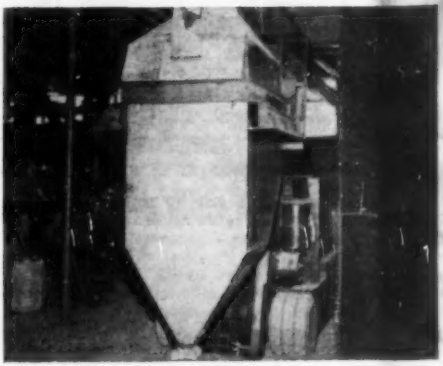
This Month's How To . . .



. . . hard-face wearing parts on a production basis is a development of Haynes-Stellite Div., Union Carbide & Carbon Corp. Process is faster than hand-torch methods, produces smoother and more uniform deposits, and requires less hard-facing rod per piece surfaced. Three mechanized methods handle long, flat parts, circular pieces, and cylindrical surfaces. Flat parts, such as plastic cutting knives, are hard-faced on a machine that has a carriage traveling on tracks parallel to workpiece. Number of parts that can be surfaced at one time is limited only by track length. Mechanized hard facing is suitable for large quantities of similar parts, but not for complex parts of which only a limited number are needed, such as only two or three surfaced per week. Setting-up cost is too high.—Am Mach, Oct 16, p189



. . . cure heater troubles and save money was accomplished by stopping (1) corrosion in water tanks, (2) overheating of water heaters, and (3) scaling of boilers. Water from a softener flows to evaporator (the big tank in the center); flow rate is controlled by float valve actuated by evaporator water level. Low-pressure steam vaporizes evaporator water. Vapor discharges to a condenser cooled by city water on its way to softeners. Condensate, now distilled water, flows to two copper storage tanks (at upper right). To keep distilled-water temperature at 160° F. and obtain balance between cooling water available and distilled water demand, a vacuum pump maintains 5-in. Hg. abs. pressure in storage tanks. Thermostatic valve protects softening equipment against high temperatures.—Power, Nov, p94



. . . handle dry bulk materials is a key to cutting costs in any plant employing these materials in its processes. The Norton Co. uses this 8,000-lb. tank to carry abrasive grain in its new wheel-making plant. Formerly, grain for each batch was carried in twenty 400-lb. cans. Now, the whole batch is carried in one container. The dust hazard is removed and there is no chance for contamination or spillage. A rack built onto a standard truck chassis transports two tanks from storage to mixing where a special lift truck holds the tank under the mixer. An overhead crane then takes loaded tank from lift truck and stores it in racks until needed. Manhandling is entirely eliminated, so materials move faster. In 16 months of operating, Norton Co. has cut its handling costs 37%.—Factory, Nov, p102

Milkstone Can Be Controlled by Processing and Cleaning

Formation of milkstone, or precipitated solids, on processing equipment is a persistent problem in the dairy industry. Whenever milk is heated, a certain amount of solids are precipitated and deposited on equipment surfaces.

Objections to milkstone are that it is an insulator, unsightly, a source of high bacteria counts, and a source of off-flavors and odors. These three steps are important in its control:

1. Prevent formation by making sure that pasteurizing equipment is in good repair and that milk is not heated by direct steam. Hot water in plate units should not be circulated after milk is shut off.

2. Rinse equipment with tepid water as soon as possible after using. Water warmer than 120° F. should never be used until all milk solids are removed. Tepid rinse water also cools the equipment and prevents milk drying on its surfaces.

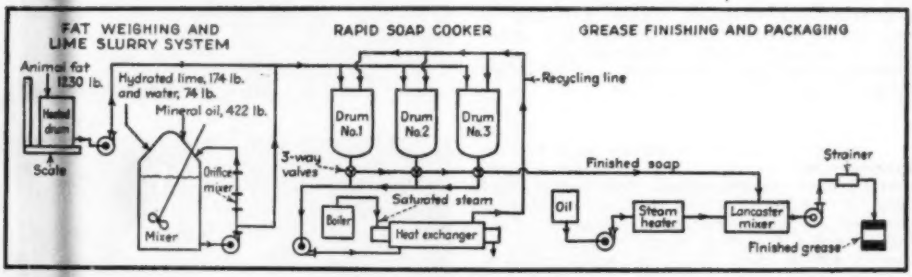
3. Clean equipment thoroughly every day. The cleaning solution should contain a wetting agent and a water-conditioning chemical. After the equipment is scrubbed, it should be well rinsed with hot water. A cold-water rinse will then give a filmless, cloudless surface, especially on stainless steel, and remove any hard-water salts precipitated by the hot water.—Food Ind, Nov, p87

Polyethylene Shoe Counters

Greater stability and longer life are among the advantages of the molded polyethylene shoe counters now being made by the Endicott Johnson Corp.

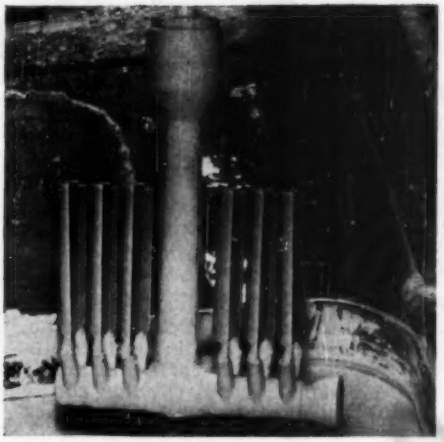
The parts are injection molded and before assembly are dipped into an adhesive and then dried. The inner surfaces of the shoe quarter and quarter lining are coated with a special agent that reactivates the adhesive on the polyethylene counter when the surfaces are placed together.

The entire shoe upper is next assembled on the last and the adhesive-coated counter slipped into position between the quarter lining and the quarter. The rest of the shoe-building operation then proceeds in a normal manner.—Mod Plastics, Oct, p82



NEW PROCESS MAKES GREASE CONTINUOUSLY

New grease-making plant at Esso Standard Oil Co.'s Baltimore refinery is the first to get away from the conventional batch method. In 1 hr., it can produce more grease than the largest batch kettle can in 4 hr. Fat is weighed in heated drum and pumped to soap cookers where it is mixed with hydrated lime-slurry. One drum is used while the other two are being charged. Circulation through a heat exchanger produces finished soap, which then passes to a mixer. Soap and lubricating oil are mixed to produce lime-soap grease, which is strained and pumped to the packaging area. A typical formulation processed in the plant is: 1,230 lb. of fat, 174 lb. of hydrated lime, 74 lb. of water, and 422 lb. of mineral oil.—Chem Eng, Nov, p285



PRECISION CASTING WITH FROZEN MERCURY

Intricate shapes, thin sections, sharp edges, and better dimensional accuracy are possible with castings made from frozen-mercury patterns. The process: A metal die, made to precise contours of the finished part, is filled with mercury. The die is submerged in a bath at —135°F, freezing the mercury. Then, the frozen piece is removed from the die (left) and attached along with other patterns to a frozen-mercury sprue. The assembly is then dipped (right) in a series of ceramic slurries to build up a ¼-in. coating. When the coating is hard, the mercury is melted out with a room-temperature mercury spray. After firing, the mold is ready for casting. Mercast Corp. developed the process for casting gas-turbine blades.—Business Wk, Nov 11, p85

"Inside-Out" Condenser

An irrigation pump at the River Plant on the Rio Grande River is driven by a 900-hp. condensing steam turbine. The turbine exhausts to a "flume condenser" of special design.

The condenser, which maintains a back pressure of 2-in. Hg abs., has two head boxes held apart by distant pieces and no shell. Conventional brass tubes in brass tube sheets in each head box form the condensing surface.

The condenser is submerged in the irrigation water at the pump discharge. Steam enters at the top of one head box, and condensate drains from the other. Canal cooling water flows over tube exteriors.

So actually the condenser reverses the usual procedure by condensing steam within the tubes. Advantages: better thermal efficiency, good feed-water recovered, less fouling with mud and debris.—Power, Nov, p119

Helicopter Automatic Pilots

Until now a helicopter pilot has had to "fly" his craft constantly, using both feet and both hands to handle the many helicopter controls. With the automatic pilots, developed by Sperry Gyroscope Co. and U. S. Naval Instruments Laboratory, the craft can be automatically controlled throughout its speed ranges, in maneuvers, and while hovering.

The helicopter pilot now has complete automatically stabilized control in any flying attitude. Blind flying and instrument landings in zero weather are now possible.—Aviation Wk, Nov 20, p17

Technical Shorts

Modern Precision, Old Machine—When Warner & Swasey wanted to cut the right ascension worm for a new 24-in. telescope for University of Michigan, they hauled out a 40-in. automatic dividing engine built by Ambrose Swasey 50 yr. ago. Maximum error of machine is 1 sec. of arc, or 1/3 in. subtended at a distance of 1 mile.—Am Mach, Oct 30, p88

Polyethylene for Shippers—Corrosive, volatile and high-viscosity products can now be economically shipped in steel containers. Polyethylene film liners and interior coatings eliminate costly cleaning and reconditioning of steel drums.—Mod Packaging, Oct, p132

Black Is Favorite Color—The most frequent color requested by Buick automobile buyers is black. An exception is western U. S. buyers who generally prefer the pastel shades with black as a fourth choice.—Auto Ind, Nov 1, p22

Gas-filled Transformer — Five years' trouble-free operation has been given by a gas-filled transformer in a Spruce River Coal Co. mine. It is completely safe from shock and fire, and has been free of maintenance. It is easy to reinstall in a new location and is not affected by mine dust.—Coal Age, Nov, p67

Something New in Batter—Ready-to-use pancake and waffle batter now on the American market is held under pressure in a metal container. Press the dispensing cap and carbon dioxide inside the can flows the batter to the griddle. Advantages: no preparing, no mixing.—Food Ind, Nov, p119

Jumbo Climbs Grades—A jumbo in the development stage at the Mascot mine will climb a 15 to 20% grade to drill the breast of a stope. Chains loop over the two rubber tires on each side like treads on a tractor. Each pair of wheels is driven by an air motor so that steering is similar to that of a tractor. Details of drilling practice still have to be worked out.—Eng & Min J, Nov, p123

LIGHTS RECORD QUALITY OF WORK

Signal board over each of the three television-receiver production lines at Allen B. Du Mont Laboratories helps quality. An inspector on the line sets the light according to each hour's output—amber for "In control," red for "out of control." The lights keep the workers on their toes; they compete to keep the amber lights burning. Soon after the score boards were put in, quality improved noticeably.—Factory, Oct, p93

Guard Your Ears—Loud noises in factories can mean deafness, fatigue, nervous tension, and serious accidents to workers and labor turnover, absenteeism, and loss of production to management. Noise abatement in one textile mill resulted in a 3% production increase.—Weld Eng, Nov, p56

How to Save Weight—Kaiser-Frazer engineers reduced the number of major stampings from the 140 in a conventional automobile to only 80 in its new small Henry J. An example is the roof stamping, which extends from windshield clear back to the floor pan. Final weight is 2,300 lb.—Iron Age, Oct 5, p70

Stacking Wood—Sweating, warping, and cracking of wood crossarms not completely cured are prevented by stacking this way: Put one crossarm across every other row, alternating at front and back of stack. One side of every crossarm is thus exposed to free circulation of air.—Elec World, Sept 25, p112

Skip-stop Elevator—Each building in the Chicago Dwellings Association housing project will have two elevators that will stop only at every third floor. Only floors with elevator stops will have corridors. Stairways on those floors will lead to apartments below or above. Elimination of corridors on non-stop floors will provide more space for apartments and reduce construction costs.—Eng-News Rec, Nov 2, p12

Longest Milling Machine—Boeing Airplane Co. has installed an Onsrud spar mill 105 ft. long. Carriage houses four cutter motors of 200 hp. total. Carriage speed runs from 10-200 ipm. Rate of metal removal is 2½-4 cu. in. per min. per hp. for total of up to 800 cu. in. per min.—Prod Eng, Nov, p161

Other Titanium Applications — Experiments at a U. S. Air Materiel Command laboratory will use titanium for a guided missile wing and for the complete aft fuselage section of a jet fighter. Rivets, forgings, and sheet will all be titaneum.—Aviation Wk, Nov 13, p11

Wanted: High Humidity—W. D. Byron & Son's tannery stores hides at 31-33° F. and 85-90% relative humidity. High humidity at freezing temperature is obtained by absorbing blower's heat energy and consequent drying of air by installing blower behind cooling coils, instead of some distance beyond them.—Oper Eng, Nov, p38

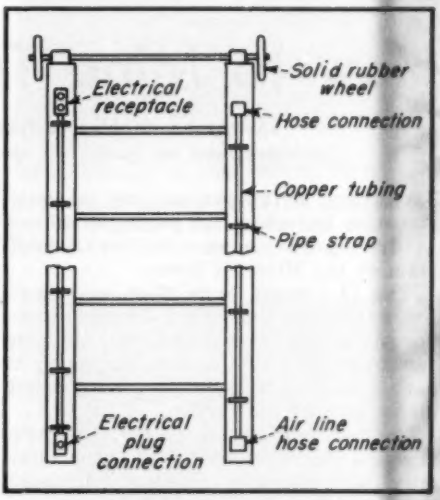
Radio Brings Doctor—When the doctor cannot be reached by ordinary means, Telanserphone, Inc., transmits a coded signal. The doctor carries a pocket receiver. He can tune in any time, to hear if his signal is on. If it is, the doctor calls Telanserphone and gets his message.—Business Wk, Nov 11, p104

New Dutch Yarn—Royal Dutch-Shell Laboratory in Amsterdam has developed a textile yarn by reacting natural rubber and sulphurous dioxide and using a wet spinning process. Its tensile strength equals that of viscose rayon, it can be made of same fineness as acetate and viscose yarns, and it can be dyed with basic and acetate dyes. It is resistant to many organic solvents.—Chem Eng, Nov, p248

Detergent Is Radioactive—Atlantic Chemical Co.'s detergent contains mildly radioactive iodine. It is employed in setting up washing procedures. By means of the dedetergent and a Geiger counter, presence and strength of detergent can be measured in initial solution, fabric, wash water.—Textile World, Nov, p171

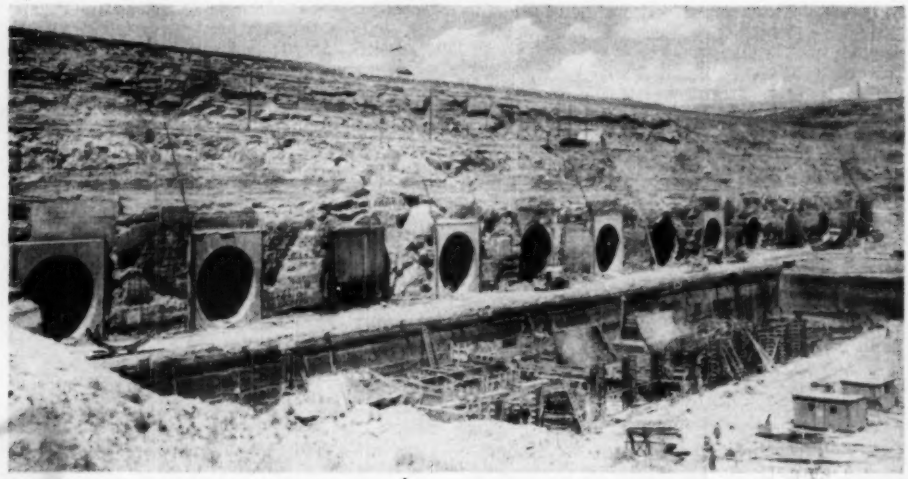
Workers Wear Respirators — Bethlehem Steel Co. has found out how to get its workers to wear respirators when they should. After every shift, workmen turn in all respirators. Next day, each worker is given a cleaned, sterilized, cellophane-wrapped respirator.—Steel, Oct 20, p75

Cheap Skylights Are Plastic—Instead of corrugated glass for skylights, try corrugated plastic sheets reinforced with glass fibers. It gives a soft glareless light and cuts out about twice as many heat rays as heat-resistant glass. Cost is about half that of glass.—Factory, Oct, p123



MAINTENANCE LADDER

Here is an idea that will speed up your maintenance work. Put solid rubber wheels on the top of maintenance ladders so they can be wheeled from place to place and raised easily. Then mount electrical connections on one side frame of each ladder and air connections on the other.—Elec World, Oct 23, p131



EIGHT OF THESE TUNNELS are for power; four are for reservoir regulation and flood control. All 12 will be utilized for diversion of the river during closure.

How to Mine Tunnels in Chalk

Saw-jumbo enables contractor to save on excavating and concrete as two men on jumbo do work of 16 men line-drilling in half the time

INGENUITY, INVENTIVE ABILITY, and construction know-how are paying dividends in driving 12 tunnels at Fort Randall Dam on the Missouri River.

The 12 tunnels have 22-ft. and 28-ft. finished inside diameters. Special jumbos mounting a conventional slabbing saw (coal saw) that cuts the periphery of each tunnel to a neat circle are saving money for the contractor.

The contractor gets paid for excavation and concrete lining clear to the maximum pay diameter (B-line). Actually, the diameters of the rough bores average about 3-4 in. less than the diameters of the B-lines. Consequently, by this precision boring the contractor gets paid for some material he does not remove and for some concrete he does not have to place.

A third advantage of sawing the periphery of the tunnel prior to blasting is that no "cut-shots" are needed. All holes can be drilled straight in and fired as "lifters" in standard delays, starting at the top line of holes and ending at the bottom line. This makes for uniform breakage, easily handled by the mucking machine.

Eight tunnels are for hydroelectric power; four are for reservoir regulation and flood control. All tunnels are 873 ft. portal-to-portal. Three flood-control tunnels are 22-ft. ID for their entire lengths. The eight power tunnels and the other flood-control tunnels are 22-ft. ID for 225 ft. at the upstream end. The remaining 648 ft. of tunnels are 28-ft. ID. Tunnels are located 70-ft. c-c.

The Niobrara Chalk, through which the tunnels are being driven, is fairly hard, but specifications required cutting

or line-drilling around the periphery of the tunnel to a penetration of 8 ft. before blasting and 8 ft. round. Purpose was to prevent damage to the chalk rock outside the bore of the tunnel.

Starting with an all-welded jumbo frame, the contractor made two heavy ring templets on which the slabbing saw operates. They were mounted at the front of the jumbo and the chain-driven cutter head saw was modified to operate around them in a circle.

An extension head on the saw has a 16-in. radial travel. This mechanism permits the saw and its driving head to be moved out and set for cutting a circle of the required diameter. Then it is pulled back clear of the face and retracted radially to clear the inside of previously set tunnel ribs so the jumbo can be pulled back from the tunnel heading while blasting.

First, the saw jumbo is moved into the tunnel and up to the heading. Starting at the 4-o'clock (lower right) position the saw is "sumped-in" to its full 8-ft. depth and cuts clockwise around to the 7-o'clock position. It is retracted, moved a few inches around the circle, and sumped-in again, leaving a small plug. Sawing continues up to the spring line (9-o'clock).

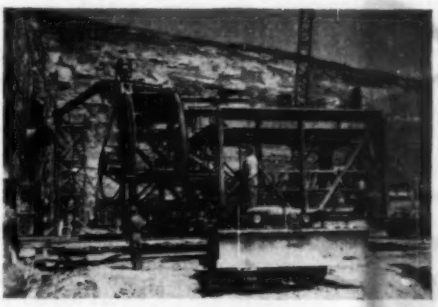
At this point, the sawing is stopped until all blast-hole drilling is completed. Then it is continued around to within a few inches of the 4-o'clock position, leaving a second plug to hold the huge core of chalk in position.

Miners drill from the saw jumbo, with hand-held jackhammers operating 1¾-in. twisted, solid diamond-steel drills. An 8-ft. deep hole can be drilled in about 1½ min.

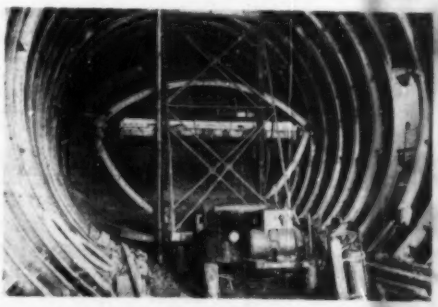
The chalk shoots easily. The sawed periphery gives compression relief during blasting—done in 6 waves of delays from top to bottom.

Best week's work has been 311 ft. of tunnel in driving three tunnels simultaneously and working 24 hr. per day, 6 days per week.—Eng-News Rec, Nov 2, p38

***OPERATING MECHANISMS** of the job-developed rig include a 9-ft. slabbing saw with chain-driven tungsten-carbide teeth.*



***AFTER EACH SAWING CYCLE**, the jumbo is pulled out of the tunnel and moved into position for making a saw-cut in another tunnel.*



***VERSATILE TRUCK-MOUNTED JUMBO** saves 50% in setting rib-steel. Invert is set first; then 3-piece hinged rib is hoisted into correct position bolted to complete the circle.*

Tire Tread Noise Analyzer Uses Photoelectric System

The noise a tire makes in speeding over a road can be studied by isolating the noise of a particular element in the presence of the many that result from the tread design.

To do this, different tread designs are cut into an otherwise smooth-treaded tire at various positions along the circumference. This is done instead of using one tire for each tread as required in the old method.

The study is made with a noise analyzer. A microphone is clamped in position alongside the tire, which bears against a 5-ft. steel wheel protruding through the floor of a sound-proofed room. A photoelectric commutator generates a synchronizing pulse for selecting noise from the desired tread pattern sample.

As the tire rotates, the electronic system acts somewhat the same as a stroboscope does in the study of moving machinery. It permits just the signal of one tread design to pass, blotting out the others. So even though only a part of the tire may have a particular tread, there is a continuous indication.

After the noise signal is passed through a transient analyzer, the analyzer output can be observed or photographed on an oscilloscope screen.—Electronics, Nov, p84

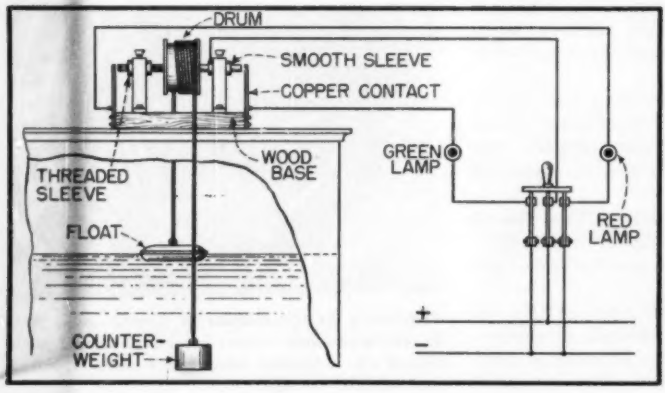
Novel Precision Thermostat

New thermostat developed by the U. S. National Bureau of Standards provides smooth, continuous electric-furnace control between 1000-1500° F. The furnace winding serves as the sensitive element, forming part of a bridge circuit for control of a thyratron tube.

The thyratron circuit acts as a continuously variable valve. It allows just enough current to reach the furnace to compensate for temperature fluctuations. Temperature can be controlled within ± 0.1° C. for several hours or ± 1° C. for several days.—Iron Age, Oct 19, p85

Weld for Wide Steel Sheets

The high cost of extra-wide steel sheets can be avoided by welding the regular-size steel sheets with either a lap or a butt weld. Welding methods include seam welding, multiple spot welding, flash butt welding, and mash welding. The first two processes produce a lap weld suitable for use in concealed parts, and the latter two processes make a seam that, when ground flush and finished, is invisible.—Auto Ind, Oct 1, p53

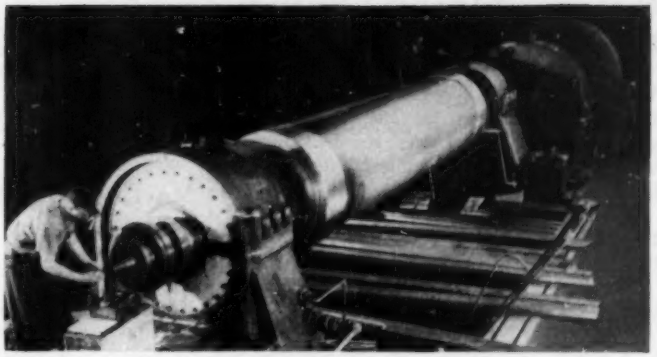


HIGH, LOW-WATER ALARM FOR TANK

This is how the signal system shown works: When water in the tank is at a normal level, the drum is midway between the sleeve supports and a closed circuit is not made. If the water level changes, the drum and shaft rotate, causing the shaft to advance toward either contact depending on whether the level rises or falls.—Eng & Min J, Nov, p112

HOW TO OBTAIN THERMAL BALANCE

Effect of non-uniform heating or cooling of generator-rotor body is thermal unbalance. It is corrected by plugging vent openings until rotor temperature equalizes. With salient-pole machines, d-c. field poles are rearranged (on paper first!) until even temperature distribution is obtained.—Power, Nov, p84



Mica-Base Paint Doubles Transformer-Tank Life

Mica-base three-coat paint system more than doubles finish life on Westinghouse Electric Corp.'s distribution transformers. The prime coat of zinc-chromate and iron-oxide pigments has a vehicle giving good adhesion with desired flexibility and chemical resistance to salts, acids, and alkalis.

The second coat has a vehicle of modified phenolic and thermoset-type alkyd resins. The pigment is composed of mica flakes that overlap each other in the film and produce a shingle-roof effect to ward off moisture and oxygen. Mica also increases heat stability of the coating.

The third coat is composed of resins and pigments to withstand elements and provide good appearance.

Salt-spray and weathering tests were made to compare the mica-base paint with standard three-coat finish. At 3,000 hr., the standard finish had entirely deteriorated. After 10,000 hr. of continuous exposure, small blisters began to form on the finish.—Steel, Oct 30, p56

Tailored Heat Makes Doors

Production of slab doors has been increased from one press load every 24 hr. to one every 15 min. at J. W. Koehl & Son, Inc., of Los Angeles. An air drying press, formerly used with cold-setting casein glue, has been equipped with electric heat.

The heat is applied to a water-proof thermosetting resin glue that can be set in 2 min. by polymerization. There is less tendency now for the doors to warp; in the old method, the moisture from the glue was entrapped in the wood.

Stainless-steel sheets, 40x96x0.025 in., act as heating elements. They are placed in direct contact with glued door panels. Seven doors are handled in one press load.

A 55-kva. transformer on top the press supplies 27-volt power to maintain a watt density of 2 watts per sq. in. and heat the sheets to 300° F. Pressure on the work is 200 psi.—Elec West, Oct, p80

Glass-and-Nylon Tent

Portable tent in which even the tent poles are made of glass-and-nylon fabric has been developed by B. F. Goodrich Co. for use as a field-photo laboratory. The fabric is waterproof and fireproof and will not admit light.

The tent covering comes in sections and is zipped together over supporting members, which are actually fabric air tubes inflated to 3 lb. The structure is 20 x 80 x 16 ft., weighs 750 lb., and can be set up by six men in 1½ hr.—Prod Eng, Oct, p155

How to Get Longer Life from Rubber Transmission Belts

With rubber in short supply, users of rubber transmission belts will want to get the most out of them. Here are a few tips that can lead to a longer life for your belt:

1. Standardize on as few widths and plies of rubber belt as will economically meet plant requirements.
2. Use proper sizes and types of fasteners for belts.
3. Inspect joints in belts periodically and repair them at the first signs of trouble.
4. Do not operate belts at speeds above 5,000 fpm. without consulting the belt manufacturer.
5. Avoid excessive crown on pulleys.
6. Select belts of proper thickness and width for pulleys and load.
7. Align shafting and pulleys so that the belt runs true on pulley faces.
8. Do not operate a belt running off one side of the pulleys.
9. Do not let a belt rub against stationary objects.
10. Avoid idlers if possible.
11. Where possible, operate belts with the slack side on top.
12. Give careful attention to belt shifters.
13. Do not let a belt slip excessively.
14. Dress the belt sparingly and only when needed.
15. Keep lubricating oil from getting on belts.—Ind Dis, Nov, p70

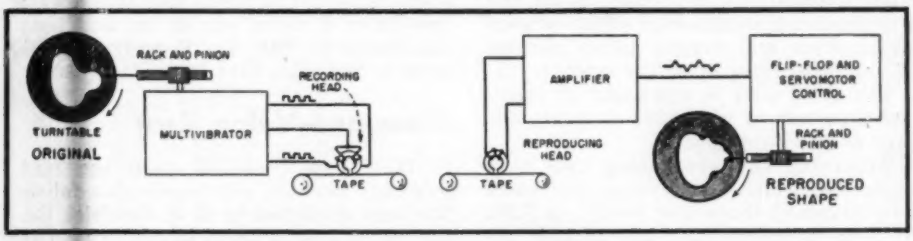
Vertical Bus Distribution

Unusual feature of Macy's new San Francisco department store is a vertical enclosed bus bar distribution system. Four busway feeders are carried upward to top floor to supply lighting panels located at various levels.

Frames are supported every 4 ft. by clips welded to continuous 4 x 4-in. angles that extend vertically to the top of the risers. The angles are supported at each floor level by brackets and by bolts inserted every 42 in. into the concrete walls of the riser shafts.

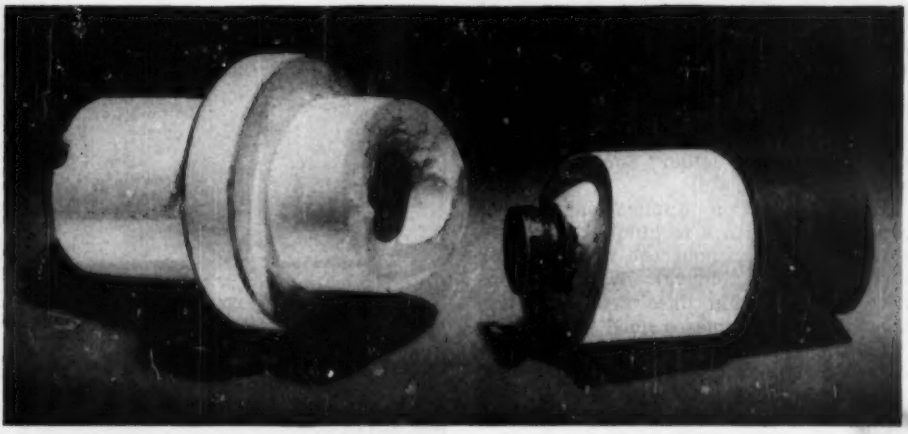
The feeders pass through service closets containing panelboards for local control of power and lighting. Boards are equipped with air breakers and are of flush-mounted dead-front steel-cubicle construction.

Maximum voltage drop from service entrance to the most remote panelboard is less than 2 volts.—Elec C&M, Oct, p55



SHAPE RECORDING WITH RATIO-MODULATED TAPE

Automatic machinery can be controlled by a memory system that uses pairs of square waves to record the effect of position on a magnetic tape. Shape to be reproduced (left) is fastened to turntable. A feeler actuates the multivibrator that generates square waves of current. Waves flow through recording head and resulting flux density is recorded on tape. In reproduction (right), head differentiates recorded flux and voltage peaks are fed to flip-flop circuit that reconstructs square waves. Servomotor positions stylus to generate replica of original shape. System is ratio modulated to overcome weaknesses, such as insufficient accuracy, of amplitude modulation, amplitude-modulated carrier, or frequency modulation.—Electronics, Nov, p104



PORCELAIN was bonded to metal with an ethoxyline resin and the part tested to destruction. The porcelain failed but the resin bond remained intact

Ethoxylines: What They Are

The metals and electrical fields will feel their impact first. But other industries will find much of interest in ethoxyline resins

DEVELOPED IN EUROPE, ethoxyline resins are suitable for bonding, casting, and surface coatings. They are thermoplastic in character, but when cured or hardened the final product is thermosetting. Curing of ethoxylines can proceed at room temperature or at elevated temperatures.

The hardened products exhibit these properties: (1) little shrinkage during hardening; (2) exceptionally high adhesion to the surface of materials with which the resins come into contact during hardening; (3) practically no elimination of fugitive materials during curing; (4) high mechanical strength, notable chemical resistance of the cured resin, and excellent dielectric properties.

The three basic forms of commercial ethoxylines—bonding, casting, and surface coating—are available in seven different groups. They include a heat-setting adhesive in solid form, a heat-setting and two cold-setting adhesives in liquid form, a casting resin, and two surface-coating resins.

Bonding—Unusual cementing jobs are being done in the machinery and machine-tool field by means of ethoxyline bonding resins. Wear-resisting metal parts are being bonded to supporting bases, such as tungsten carbide tips for cutting, turning and boring tools. In textile machines, the resin has bonded sapphire thread guides to aluminum arms.

Satisfactory bonds have been made in metal-glass and metal-ceramic assemblies. In tests, a metal-Pyrex glass joint failed in the glass portion. The same resin has also formed seals in X-ray tubes and is at present used as a repair cement for high-vacuum pumps.

The heat-setting liquid-type resin is now being employed as an adhesive for electric motor, dynamo and transformer

laminations because it has high insulation resistance as well as good thermal stability and high adhesive strength.

When the cold-setting adhesive is combined with an inert filler, the result is a tile cement of high alkali resistance or a shrinkless body "solder" for automobile and bus body repair.

In refrigeration applications, joints can be made with a technique similar to soldering, but without the necessity for fluxing and flux removal. Wherever copper and aluminum lines are connected, the adhesive provides a good joint.

Casting—The ethoxyline casting resin serves in many electrical applications. As a potting agent for high-tension cable tips, its merit lies in its high insulation value and temperature stability. The resin's high dielectric strength, corona resistance, and ease of working make it useful in potting high-voltage electronic components.

Since the cast resin machines easily, it is also applied in the manufacture of automatic-screw-machine products.

Surface Coating—Because of their adherence to metals, surface-coating ethoxyline resins are excellent as corrosion-resistant can liners, as insulating varnishes, and as impregnating varnishes. They have been successfully applied to chemical tank linings. They are resistant to chlorine, hydrochloric acid, phosphoric acid, and calcium hypochlorite solutions.—Mod Plastics, Nov, p85

Cyclone Recovers Values

Formerly slimes from a drag classifier in the crushing plant of Telluride Mines, Inc. went to the tailings pile because it was uneconomical to recover the values contained. Now the slimes are diverted to a cyclone installed above the drag classifier in the grinding circuit. Result: a substantial additional recovery is made from material formerly discarded. Approximately 80% of the values contained in the slimes are recovered.—Eng & Min J, Nov, p112

PROPOSED MESSINA STRAIT BRIDGE

Costing $60-million in ECA Italian counterpart funds, proposed bridge will span the Straits of Messina between Italy and Sicily. The bridge, if built, will break some records. Its main span of 5,000 ft. is 800 ft. longer than that of Golden Gate Bridge. Side spans of 2,400 ft. are longer than main spans of all suspension bridges except Golden Gate Bridge and George Washington Bridge. And its stiffening trusses would attain a depth of 165 ft. D. B. Stienman of New York designed the bridge.—Eng News-Rec, Oct 12, p31

Trailer Needs No Tractor

A new cargo carrier developed by Twin Coach Co. combines a trailer with a horizontal in-line engine, eliminating the separate tractor. Fruehauf Trailer Co. supplies the trailer and Twin Coach Co. installs the driver's compartment, axles, brakes, steering, and engine. The engine is an underfloor model available as either gasoline or propane driven.

A unique feature cargo carrier is the dual front-wheel truck that utilizes a Fruehauf fifth-wheel assembly with a hydraulic-boosted steering mechanism.—Auto Ind, Nov 1, p37

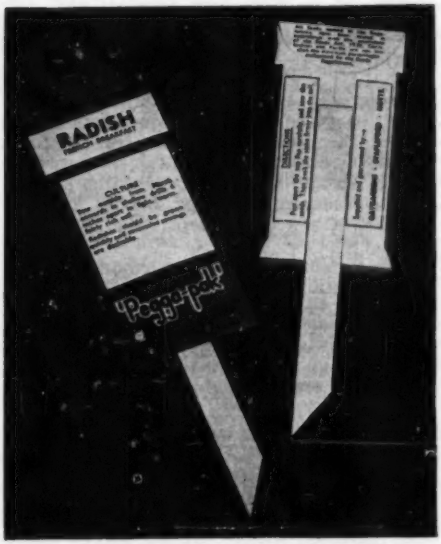
Cleaning Aluminum Alloys for Superior Spot Welds

Spot welding of aluminum alloys at Boeing Airplane Co. is preceded by thorough cleaning in an alkaline degreasing solution, washing, dipping in oxide-removing solution of hydrofluosilicic acid, a second washing, and hot-air drying. Mating surfaces for high-strength joints are then buffed.

To prevent reformation of oxide films, time limits for welding are strictly enforced. Wherever possible, wire-buffed high-strength joints are welded within 30 min. after cleaning. If more time is needed, as for assembly, parts are tacked immediately after buffing; welding may then be delayed up to 24 hr.

After cleaning, samples are given an electrical-resistance test. A 100-amp. current is passed through two mating samples. A meter indicates resistance of the residual oxide film. Surface resistance is kept below 21 microhms.

Fabrication does not begin until other samples are welded and tested for shear. Similar tests are made throughout assembly.—Weld Eng, Nov, p17



SEED PACKETS ARE GARDEN MARKERS

With this new seed packet, you do not have to write out and make garden indicators. The British firm of Gaygardens, Long Eaton and Stapleford patented idea consists simply of a paper seed packet attached to a hardwood veneer stake 5½x½ in. The lower pointed section protrudes below the packet for insertion in the ground. To insure weathering properties, a good quality paper, light-fast printing inks and a durable cement are used.—Mod Packaging, Oct, p113

Controls Steel Quenching

A recently developed method to improve control of quenching time for heat-treated steel parts is based on the fact that austenite is not ferromagnetic. But as the steel cools, the austenite transforms to the desired martensite, which is magnetic.

The controller consists of a system of coils in the quench tank. As martensite forms, flux linkage between coils changes, thereby raising the voltage in one coil and resulting in a net signal output. The signal when amplified actuates an alarm.

The system can be adjusted so that the alarm sounds when the amount of martensite desired is formed. Sensitivity is excellent.

The controller was developed for use in a metallurgical laboratory.—Electronics, Nov, p109

Aids Borehole Maintenance

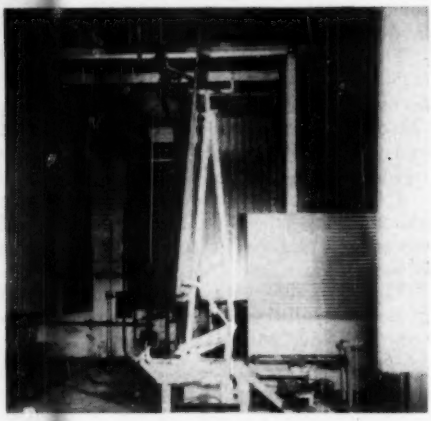
When other methods failed to determine the nature of an obstruction in a 16-in. borehole, engineers of the Glen Alden Coal Co. lowered a camera and flashbulb assembly into the borehole to bring back a photographic record of conditions in the hole. At a predetermined depth, the flashbulb circuit was closed to expose the film. Excellent results were obtained, simplifying good repairs.—Coal Age, Oct, p104

New Products

Finds Cable Faults—Fault finder permits quick location of short circuits and open-type faults in cables. No skill or calculations are needed. Lightweight transmitter and receiver operate on batteries.—**Joy Mfg. Co.**—Coal Age, Nov, p116

Magnetic-base Lamp—Shop lamp with its Alnico permanent-magnet base can be mounted on any iron or steel surface. Universal ball-and-socket and swivel arm allow positioning at almost any angle.—**Enco Mfg. Co.**—Power, Nov, p 146

Prints Gummed Tape—Unit fits any tape shooter and will print on tape 1-4 in. wide as it is used. Message printed is up to 8 in. long and is said not to smear or blot and is waterproof.—**Travers & Co.**—Mod Packaging, Sept, p156



HANDLES 400-LB. DOORS

Completely automatic equipment handles assembled steel doors, 8 ft. wide, 14 ft. high, and 400 lb. in weight. Unit lifts door from horizontal to vertical position by means of long holding frame equipped with rollers on bottom and small permanent magnets at the top. Door is then thrust forward and hung on overhead conveyor for travel through painting and baking to shipping. Allied Steel & Conveyors, Inc., built the equipment.—Iron Age, Nov 2, p95

Power Hand Trucks—Two new trucks—one battery-powered with motor drive and the other gasoline-engine-powered with hydraulic pump and drive—feature compactness, good maneuverability, ample power, and accessibility. Electric motor is 1¼ hp. and is mounted inside 14-in. drive wheel. Gasoline engine is 2-cyl., air-cooled, and rated at 5½ bhp. at 2,800 rpm.—**Clark Equipment Co.**—Food Ind, Nov, p95

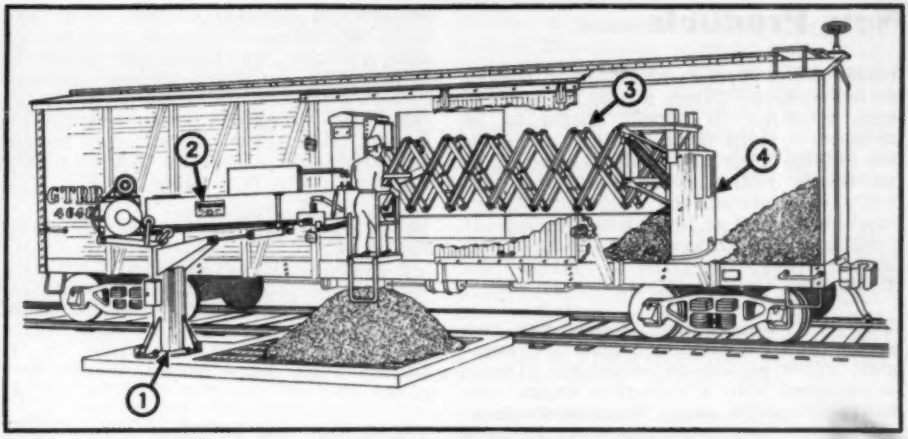
Hardens Gears—R-f. gear-hardening machine, called the Inductall, hardens shafts, spur gears, cluster and integral spindle gears by either through or contour hardening. It is used with vacuum-tube r-f. generator and 10,000-c. motor-generator set.—**Westinghouse Electric Corp.**—Elec World, Oct 30, p29

Flameproofs Cloth—Permaproof 300, applied in padder box, flameproofs cloth, makes it mildew-resistant, and improves tensile strength. Compound is combination of special latices and contains no pigment.—**Treesdale Labs & Textile Processing Co.**—Chem Ind, Sept, p436

Tough Flexible Joint—New expansion joint will withstand pressures up to 5,500 psi., temperatures from subzero to 1600° F., and 250,000 flexing cycles. It is designed to carry fluids or gases under high pressures between relatively movable parts.—**Chicago Metal Hose Corp.**—Aviation Wk, Nov 1, p44

Sterilizes Water—Ultra-violet radiation purifies water at 400 gal. per hr. in stainless-steel tank 71 in. high by 12 in. in dia. Four ultra-violet ray tubes extend vertically through water. Baffles direct water toward the glowing tubes.—**Sepco Corp.**—Elec Merch, Oct, p140

Carries Hot Metal—Electrified hot-metal carrier has two finger-tip levers to control all motions of both carrier and ladle. Operator rides in traveling cab. Power for carrier travel is supplied by gearhead motor mounted under monorail. Carrier capacity ranges up to 3 tons.—**Whiting Corp.**—Foundry, Nov, p234



UNLOADER-SWEEPER SPEEDS BOX-CAR UNLOADING

One operator with this device can unload and sweep clean a box car of bulk materials in 30 min. or less. All operations are controlled from platform outside the car door, except that of snapping brush attachment to scoop for sweeping. Unloader consists basically of pedestal (1) mounted clear of track, swinging arm (2) on which is pivoted a boom (3) that can be extended into the box car or retracted, and a scoop (4) that digs and moves material from the car. Boom retraction and extension are automatic. Manufacturer of the unloader is Stephens-Adamson Mfg. Co.—Food Ind, Nov, p94

Unloads Coiled Wire—Fork-truck accessories for model LT-40 lift truck includes special forks, ram, and hydraulic unloader. Wire spools can be lifted from take-it-or-leave-it pallets by forks, while coils in vertical position can be lifted by ram. Loads are pushed off forks or ram by the unloader.—**Towmotor Corp.**—Iron Age, Oct 26, p100

Generates Power—Model 15-CH develops power for dielectric heating applications. Output is 18-21.8 kw. at 5.5-41 mc. High-frequency output is obtained from stabilized, self-excited oscillators with two 889R-A tubes supplied by three-phase, full-wave rectifier.—**Radio Corp. of America**—Electronics, Nov, p224

Tungsten Electrodes—Pure tungsten electrodes are suitable for atomic hydrogen and gas-shielded electric arc welding of a wide range of metals. Oxides, nitrides, and other contaminants cannot form. Amount of electrode consumed is held at a minimum—**Sylvania Electrical Products, Inc.**—Ind Dist, Nov, p122

Levels Cabinets—Wobble of cabinet legs because of uneven floors is stopped by self-adjusting glide. Device utilizes property of silicone putty to contract and expand and so to adjust to new location. Glides adjust up to 5/16 in. and are supplied in sizes to carry from 10 lb. to 1 ton.—**Ever-Level, Inc.**—Prod Eng, Nov, p180

Magnets Handle Pipe—Hot galvanized pipe can be moved from kettle to cooling table by double pipe roll equipped with both permanent magnets and electro magnets. It has two rows of 12 pipe rolls in series, is 24 ft. long, weighs 5 tons. Capacity is pipe of ½-4 in.—**Magnetic Engrg. & Mfg. Co.**—Steel, Oct 23, p93

Clarifies White Water—Birds-Gibbs Clarifier removes suspended solids from fourdrinier-machine white water, cylinder-machine white water, mill waste water, board-mill combined waste water, and deinking-plant waste water. It generates tiny air bubbles that float the suspended particles, which can then be skimmed off. —**Bird Machine Co.**—Paper Ind, Oct, p774

New Products (Cont.)

Under-driven Presses—Four-point, under-driven eccentric punch presses have bearings arranged to permit shafts to be dropped straight down, without necessity for pulling. They are double-geared, have pneumatic friction clutches, and are fitted with a motor-driven slide-adjustment mechanism that allows extremely long adjustment. Sizes range from 300-3,000 tons in bed areas from 72x48 to 300x108 in.—**E. W. Bliss Co.**—Am Mach, Oct 30, p139

Two-level Bus—Luxury coach has two decks. Lower section will seat 12 passengers, upper section 25 passengers. Coach is equipped with a Cummins engine and heavy-duty drive units. Windows are large. Passengers have more space.—**C. D. Beck & Co.**—Bus Trans, Nov, p167

Mobile Drill — Equipment, designed for mounting on a Universal Jeep, will drill 4-in. hole 100 ft. deep, either vertically or horizontally. Tower is only 7 1/3 ft. high. Drill gets power from Jeep's power take-off, while Jeep's hydraulic system provides leverage for raising and lowering drill boom.—**Willys-Overland Motors, Inc.**—Oil & Gas J, Oct 26, p124

Folder Has Automatic Feed—Electrically driven, the automatic feed paper folder will fold thousands of copies per hour of various weights and sizes of papers in many different types of folds.—**A. B. Dick Co.**—Am Business, Sept, p55

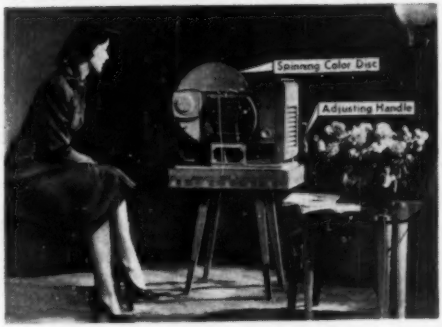
Grinds and Pulverizes—Tricone ball mill features slightly tapered shape that keeps larger grinding balls at feed end of mill. Operation advantages are proper ball segregation, maximum energy at feed end, and less wear on discharge gate.—**Hardinge Co., Inc.**—Ceramic Ind, Nov, p122

Sharpens Cutting Tools—Cutter and radius grinders, R-6 and R-8, have flute-length capacities to 4½ and 10 in. They are highly maneuverable, all movements are governed by positive stops, and various combinations of radii, angles, and spirals encountered in die- and mold-making cutters can be handled.—**Pratt & Whitney, Div. Niles-Bement-Pond Co.**—Iron Age, Nov 2, p38

Air Circuit Breakers—Types G-25 and G-50 low-voltage air circuit breakers are now available for individual mounting. Sheet-steel housing encloses circuit breaker and cable connections. Front has removable hinged panel, ventilating louvers, latching mechanisms, door handle, and flash barriers.—**Allis-Chalmers Mfg. Co.**—Elec C&M, Nov, p136

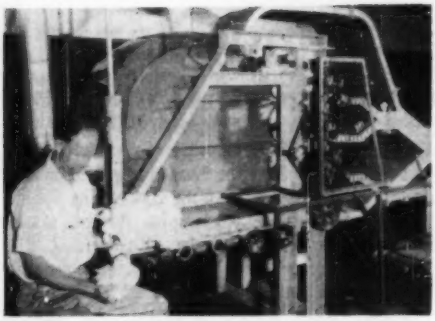
Riser Eliminates Damage—All-aluminum high-speed riser for narrow-fabric finishing automatically adjusts itself to different skein lengths and sudden tensions. Highly polished rollers, running on sealed noiseless bearings, offer no drag and can be stopped by hand at any speed.—**A. B. Landis Sons, Inc.**—Textile World, Nov, p178

Transformer Oil Inhibited — New transformer oil, known as Orto, resists oxidation, acidification, and sludging and is claimed to last several times as long as conventional transformer oil. Inhibitor added is almost completely inert. Orto is available in distribution transformers manufactured by the company.—**Line Material Co.**—Elec West, Oct, p37



FOR YOUR LIVING ROOM?

This peculiar-looking device is a television-receiver color adapter and converter mounted on a 10-in. table model receiver. Consisting basically of a spinning color disk divided into red, green, and blue segments, it is a converter for the Columbia Broadcasting system approved by the U. S. Federal Communications Commission. Limitations of this system (McG-H Digest, Feb '50, p27) have resulted in considerable resentment of the FCC order. —Elec World, Oct 23, p83



OPENER GIVES CLEANER COTTON

An improved machine for opening and fluffing baled cotton to make it clean more easily and spin better has been developed at the Southern Regional Research Laboratory. The opener has a number of toothed, gin-saw cylinders, arranged one above the other and rotating in the same direction. Small tufts are pulled out of the cotton by the rotating cylinder teeth and are then removed from the teeth.—Textile World, Nov, p176

Paints Rusty Metal—Special metal primer and enamel top coat, tradenamed Rustorize, can be applied over rusty surfaces. Loose rust is wire-brushed off before painting. Primer is fish oil plus pigment that provides air-tight, elastic film, which prevents further rust.—**McCormack-Medl Corp.**—Chem Eng, Nov, p200

Mining-machine Haulers—Track-mounted dolly for hauling heavy mining equipment requires a headroom of only 6⅛ in. Overall length is 11 ft. with a wheelbase of 8 ft. Capacity is 20 tons.—**Phillips Mine & Mill Supply Co.**—Coal Age, Nov, p114

Portable Lift—This lift is portable and operates on compressed air. It can be used anywhere an air hose will reach. Capacity is 5,000 lb., and it can raise front or rear of truck to any work level.—**Bay Mfg. Co.**—Fleet Owner, Nov, p62

Records Speed—Hand tachograph indicates speed of rotating elements on a dial and also records speed on traveling paper strip. Three range combinations available are 30-12,000; 60-24,000; and 120-48,000 rpm.—**O. Zernickow Co.**—Elec C&M, Nov, p147

Ditcher Is Tractor Drawn—Hydraulic system of this ditcher controls depth of cut, wing angles, leveling and steering operations. Drawn by crawler-type tractors (one on each side), the ditcher is one-man operated. The 1½-ton machine will dig a ditch 4 ft. deep and 10 ft. wide.—**E. V. Briscoe Mfg. Co.**—Const Meth & Equip, Nov, p104

Adds to Nylon Life—Ladies' nylon stockings wear longer and have reduced snag tendency when treated at home with a liquid consisting of polyvinyl acetate emulsion and other ingredients. After rinsing, stockings are dipped in dilute solution and thoroughly wrung out.—**G-M Liquid Plastics, Ltd.**—Chem Ind, Oct, p556

Cleans Industrial Gases—Large volumes of dirty gases are efficiently cleaned by new device. Water sprays and several stages of wet ceramic packing trap the dust. Final layer of ceramic packing catches water droplets before gas is released.—**Prater Pulverizer Co.**—Business Wk, Nov 4, p79

All-steel Pallet—Light enough to be lifted by one man, yet capable of carrying a 10-ton payload, this pallet is ideal for ship-and-return work. Pallets nest compactly, conserving warehouse and shipping space. Four-way fork lift entry is provided.—**Powell Pressed Steel Co.**—Factory, Nov, p168

Concrete-cutting Machine — Pavement-cutting machine has twin saws for cutting parallel grooves in concrete pavements. Mounted on 4 rubber tires and powered by a 75-hp. gasoline engine, the machine is equipped with both direct gear drive and dual-steer hydraulic drive. Cutting speeds range from 5 ipm. to 5 fpm.—**Joy Mfg. Co.**—Eng-News Rec, Nov 16, p121

READER SERVICE

As a special service to our subscribers, McGraw-Hill Digest will furnish without any charge additional information about any new product or technical development described. Address your letter to: The Editor, the McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y. U. S. A. —*THE EDITORS*

Unusual Delayed-Coking Plant

New coking unit, put into operation just a few months ago, features largest coke drums, unique coke-handling system, hydraulic decoking

DELAYED-COKING UNIT at the El Dorado refinery of Pan-Am Southern Corp. incorporates several new design developments. In use since August, the unit is designed to charge 9,300 bbl. per stream day of reduced crude and to produce 1,950 bbl. of gasoline, 5,240 bbl. of gas oil, and 420 tons of coke.

Among the special design features are two large coke drums, 17 ft. 6 in. in dia. and 96 ft. 5 in. from flange to flange. These are believed to be the largest coke drums placed in operation in delayed-coking units.

Another unique feature is the coke-handling system, which channels the falling coke to a dewatering basin below the drums. Decoking water drains from the basin, and a dragline scraper transfers the coke to an adjacent storage pile.

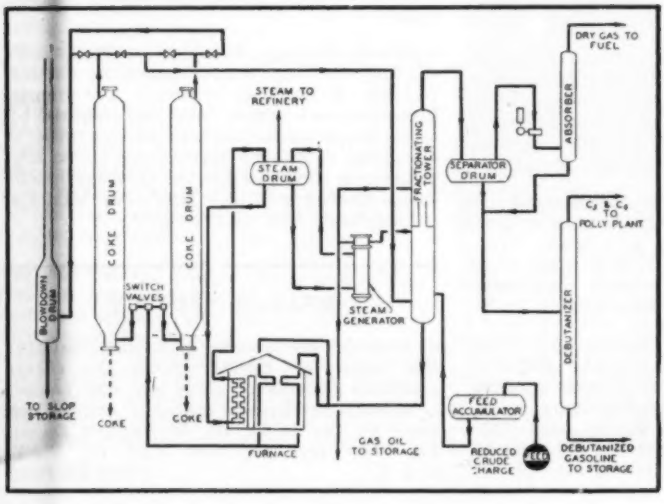
Oil flow through the unit, as shown in the flow diagram, is similar to that in other delayed-coking units. Crude oil is fed at 650° F. to a feed surge tank and then to the fractionating tower, in which hot vapors from the coke drums strip light virgin gas oil from the crude. The heavy crude plus a heavy gas oil recycle accumulate in the bottom of the tower.

From the tower bottom, the oil is charged through two parallel coking coils at a design rate of 10,475 bbl. per stream day. Oil flows through the radiant section only of the furnace. Coil outlet temperature is 920° F.

Outlet streams from the coils combine and flow to switch valves, then to coke drums. The hot oil, which is 65% vapor, enters drums at bottom. The liquid reacts to form coke, which gradually builds up into a bed. Drums fill with 423 tons of coke in 24 hr. The unit is hydraulically decoked by a jet pump, and the coke drops to the dewatering basin.

Vapors from the coke drums flow to the fractionating tower in which they are fractionated into gas, oil and gasoline plus wet gas. Vapors from the tower pass through a distillate and wet-gas separator drum.

Wet gas is compressed, recontacted with distillate, cooled, and flashed. The gas then flows through to absorber



***FLOW CHART** of new delayed-coking plant, designed and built by Lummus Co., shows the path of oil and vapors through this 420-ton-per-day unit*

columns, which remove 90% of butanes and 35% of propanes.

The flashed distillate is pumped to a debutanizer column, which produces a debutanized bottoms gasoline and a C_3-C liquid overhead stream.—Oil & Gas J, Oct 26, p76

Tapered Submarine Cable Installed without Armor

Unusual 15-kv. submarine cable, 20,000 ft. long, has tapered conductors laid in sea water without protective armor. The installation, in the Gulf of Mexico, consists of two three-phase cables, each divided into six sections.

Cable sections were graduated to secure an over-all cable of reasonably uniform current-carrying capacity under the varying ambient temperatures expected. Number of strands were 19 in two sections, 37 in two more, and 61 in the last two.

Usual practice is to protect submarine cable by winding it with galvanized steel wire. But with the unarmored cable, care was taken to avoid damage during installation and the cable was buried 3-5 ft., depending on the navigational routes and channels.

Tapering the cable was estimated to save $35,000, and omission of the armor saved $22,000 more. Installation costs also were reduced because of the considerable weight saving.—Elec World, Oct 23, p91

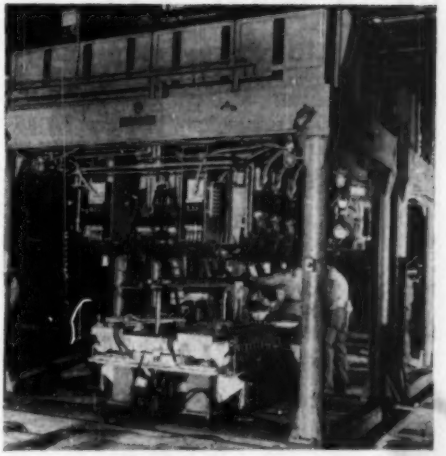
Prints on Waxed Paper

A compact attachment that can be mounted on any standard intermittent-feed wrapping machine will print information on waxed wrapping paper. Features of the device, developed by Wrap-Ade Machine Co., include heated imprinting dies and a 700-ft. roll of inexpensive, one-use marking tape.

The attachment is placed at the side of the wrapping machine between the roll of waxed paper and the draw rollers that carry the web into the machine. Imprint is made against the plate over which the web travels for electric-eye scanning.

The electric eye stops the web momentarily for cut-off and actuates the imprinting mechanism. During the split second that the web is stopped, the heated die head comes forward and stamps the desired information exactly in position.

The marking ribbon is a cellophane tape coated with wax, lacquers, and earth pigments. When touched by the heated tape pressing against the waxed paper, the ribbon coating is released and transferred cleanly to the paper. The ribbon indexes automatically after each imprint. —Mod Packaging, Sept, p102



MAKE 242 WELDS

Kaiser-Frazer Co.'s new Henry J automobile has two floor-pan assemblies welded in these machines. Front welder fires 134 guns simultaneously through 34 transformers of 30-kva. rating to build up front section of steel floor pan and component parts. Second machine makes 108 welds to attach front floor pan to rear pan section. Press manufacturer was Welding Machines Mfg. Co.—Steel, Oct 30, p58

What Is Still Needed for Better Aluminum Enameling

Potential use of porcelain-enameled aluminum is tremendous because its advantages are both many and distinct. But the process is not yet perfected. Here is what it needs:

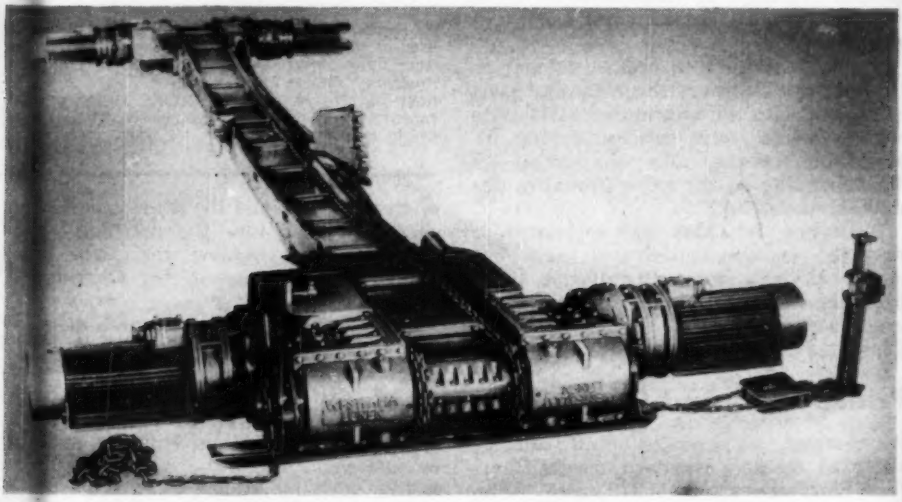
Biggest problem is warpage during firing. Needed to prevent the warpage is a frit that will mature at a lower temperature (850-900° F.) or much more quickly (3-5 min.). A help on this problem would be an enameling grade alloy that would be more rigid at high temperatures.

A second need is a reduction in the number of firings. Present practice is to fire after metal pickling and each of the three coats—one ground and two cover. A better preparation method is needed to eliminate the prefiring treatment. Of great use also would be a single-coat enameling, similar to the one-coat method for steel.

Color matching too has caused some trouble, as have the critical production requirements of the technique.—Ceramic Ind, Nov, p54

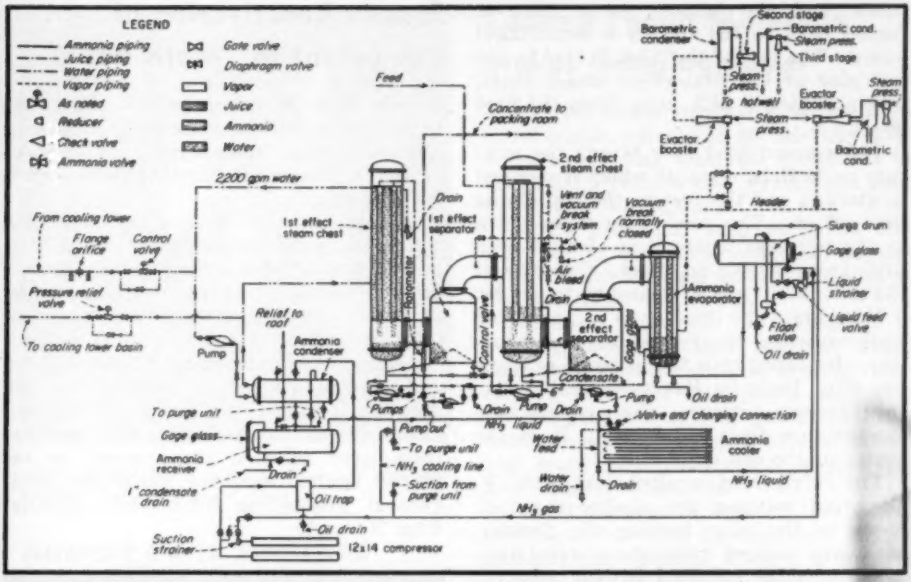
Parachute Now Automatic

U. S. Air force is now using a parachute that opens automatically. Before take-off, the pilot sets two tiny dials—a timer and an aneroid element. If he should be forced to bail out, he pulls a handle and the preset mechanisms open the chute after he has cleared the airplane and fallen to a safe altitude. The new release does not interfere with operation of the standard ripcord.—Prod Eng, Oct, p156



PLANER PROVIDES INCREASED EFFICIENCY IN SOFT COAL

New German planer can strip or plane layers of coal up to 12 in. thick off the solid coal face in a longwall panel. Planing is accomplished by pulling a vertical cutting element along the face. The coal produced is then turned onto a double-chain conveyor that serves as a face conveyor and as guide and slide bar for the planer and the wedge-shaped planer body. The planer itself is composed of two symmetrical halves, each of which is fitted with a cutting edge.—Coal Age, Nov, p90



***NEW ORANGE-JUICE EVAPORATOR** at Minute Maid uses "heat-pump" refrigeration system to condense vapor from the second-effect evaporator and heat juice in the first effect*

New Juice Processing Methods

Minute Maid has made advances in citrus-juice processing that have raised production capacity and efficiency in evaporation and freezing

TWO ADVANCES in the production of concentrated frozen orange juice have been made by Minute Maid Corp. One is in evaporation, the other in freezing.

Evaporation—The evaporator is a double-effect, low-temperature, high-vacuum, continuous unit that employs a refrigeration compressor in the heat cycle. Its efficiency is higher than that of thermo-compression evaporators. Other advantages are simplified design and lower initial cost.

Each effect is a vertical shell-and-tube exchanger, with the juice flowing down the inside walls of the stainless-steel tubes. Fresh juice enters the second effect, and concentrate discharges from the first effect. This allows juice at highest viscosity and concentration to be handled at the highest temperature.

Water vapor removed from the juice in the first effect supplies heat for vaporizing water from the juice in the second effect. Vapor from the second effect is condensed by refrigeration, and heat for the first effect is supplied by warm condenser water heated by condensation of the ammonia from the compressor.

The only steam needed is that for the vacuum jets. Source of heat energy for evaporation is the 500-ton ammonia compressor that acts as a "heat pump."

Fresh juice, at 11.3 Brix, enters the top of the second effect and flows down the

tubes. At the bottom, some juice is forced back to the top by a centrifugal pump. The rest of the juice is bled to the tail pipe of the first-effect steam chest, where it blends with juice from the first effect.

The amount bled over brings the mixture to 50 Brix, some of which is pumped to storage and the rest to the top of the first effect. The juice then flows down to the tail pipe where it is blended with juice from the second effect. Capacity of the unit is 370 gal. of concentrate per hr.

Freezing—The freezer is a converted walking-beam spray-type beer pasteurizer. Its capacity is 700 of the 6-oz. cans per min. Built by Barry-Wehmiller Co., the freezer lowers the concentrate temperature from 18° F. to 0° F. in the center of the can in 18 min.

The refrigerant is alcohol at −30° F. To avoid wasting the alcohol that adheres to the cans leaving the freezer, cans are passed through a revolving-brush machine.—Food Ind, Nov, p64

How to Thaw Frozen Pipes

Frozen water pipes are readily thawed out by using a welding generator or transformer, but certain precautions must be observed. First, no matter how the cable is connected, there must be a complete circuit between power source, pipe, and freeze.

All ground connections must be removed from the pipe before applying current, and all nearby faucets opened. Current should be started at 10-20 amp. and built up slowly.

Pipe temperature should be checked every 5 min. If the pipe is too hot to touch, it should be allowed to cool. Currents of 75-125 amp. are usually safe for lead pipe.

As the ice melts, faucets will sputter. When water is flowing freely, the current may be turned off. But the water should be allowed to run for an hour to rid the pipe of small pieces of ice that may lodge around fittings.—Power, Oct, p86

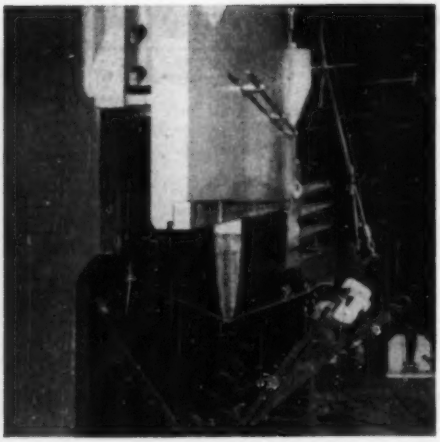
Speedy Reactivation of Equipment in "Moth Balls"

In less than 30 min. a winch aboard a U. S. Navy aircraft carrier was stripped, lubricated, and made ready for service after being sealed in vinylite resin-based film for 4½ yr.

Resistant to oil, grease, rot, mildew, fungi, and most chemicals, the tough film is also non-inflammable. The film is applied in liquid form, over a framework of pressure sensitive tape that has been built up around the object to be sealed. First a solution containing vinylite resins and a webbing agent is sprayed over the tape to produce a cobweb-like form. Then additional coats of the vinylite resin-based solution are sprayed on to protect against moisture, sun's rays, and general weathering conditions.—Marine Eng, Nov, p46

TALLEST WILL BE TALLER

Steeplejack fastens lines of temporary television tower atop the Empire State Building, New York City. Work is in conjunction with construction of new tower that will add 222 ft. to the world's tallest building's previous 1,250-ft. (above street) height. When the tower is complete, it will accommodate the antennas of three FM transmitters and Manhattan's five television stations, extending the broadcasting radius to 52 miles.—Eng-News Rec, Nov 9, p29



SHEET STRETCHING In press brake of this part requires preforming sheet edges

Aircraft Parts Stretched in Standard Press Brake

Leading-edge skins for airplane wings and tails are now being formed by the stretch-press method on a standard press brake by Northrop Aircraft, Inc. Chief advantage is much lower equipment cost; also, the conversion of the press brake does not prevent its normal operation.

The setup consists of a 400-ton brake with two hinged members fastened to the bedplate. These members are each fitted with a row of jaws 16 in. long that incorporate pneumatic clamps.

As the punch descends, the hinged members are pulled upward to their closed position by an electric hoist. The aluminum-alloy skin is thus wrapped around the punch. After it is drawn tightly around the punch, the skin is given a stretch of 5-6% to set it.

The sheet must be deburred before stretching to avoid tears. Each jaw must grip the sheet with at least one-half the jaw segments. Forming is done in the as-quenched or refrigerated condition.—Am Mach, Oct 16, p186

Cooling Tough Materials Makes Grinding Easier

Many materials normally difficult to grind can be pulverized successfully with a freeze-grinding technique developed by Linde Air Products Co. Freezing is done with liquid nitrogen.

Tough polymers, such as saran and polystyrene, are cooled until they become brittle. Then far less power is needed to fracture them to powder.

Materials that will be subjected to freeze-grinding include resilient materials that become brittle on cooling; low-melting materials that would melt with the temperature rise of grinding; heat-sensitive substances, such as insecticides and many pharmaceuticals; explosives; and volatile chemicals.

Liquid nitrogen is injected into a heat exchanger installed between feed hopper and pulverizing mill. Then it is sprayed directly on the material as it passes to the mill, cooling it by direct-contact heat transfer and simple evaporation.

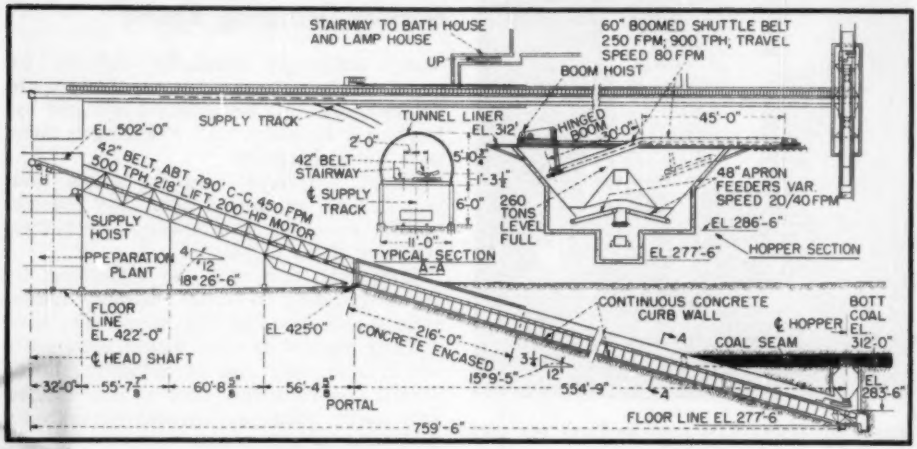
The cold gaseous nitrogen resulting from evaporation is piped to the feed hopper to precool the material and exclude air.—Chem Ind, Oct, p554

How to Find New Markets

The Nelson Stud Welding Div. of Morton-Gregory Corp. has used this three-way approach for developing new markets for any company whose basic product is a small component of a complete product.

- Develop basic engineering data on product performance and bring that data to the attention of designers throughout industry.
- Design application equipment that will be inexpensive and easy to use and will assure accuracy in production.
- Keep field engineers—who can help potential customers on applications—circulating throughout industry.—Business Wk, Sept 30, p56

Conveyor Belts, Teamed With . . .



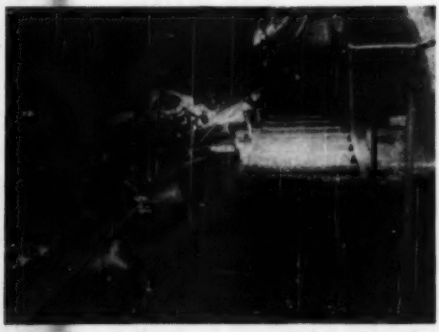
***SLOPE AND SURGE-HOPPER DESIGN** is shown here. There are two slope compartments, with the belt and stairway in the top and supply track in the bottom.*

Belt Hauls Coal to Surface

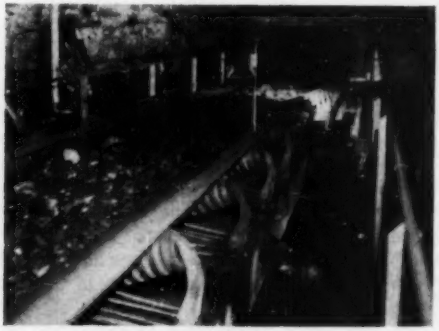
Panel and main-line belt system feeds shuttle conveyor over surge hopper and bottom of slope belt where coal is hauled to surface

MODERN MINE DESIGN called for the Pleasant View mine of the West Kentucky Coal Co. to be served by a slope belt. The slope is driven high to make two compartments, one above the other. The upper one holds the belt, and the lower one holds the supply track.

Total length of the slope belt is 790



***SLOPE BELT** delivers coal to preparation plant for mechanical treatment.*



***SHUTTLE BELT** lays coal gently into 260-ton surge hopper equipped with dual feeders.*

. . . Modern Mine Design, Increase Coal Output

PANEL BELTS discharge to main-line units through curved counterweighted chutes.

MAIN-LINE BELT transfers have automatic sprays turned off and on as belts run empty or full.

ft. center to center. Length in ground is about 570 ft. Inclination below the portal is 15°; above the portal it is 18°. Total lift is 219 ft. The belt is a 42-in. Goodyear Compass 100 unit fabricated with cord. Operating speed is 450 fpm. The belt is protected against spills at the top by paddles and knife switches. A backstop is installed to prevent rollback. The belt is driven through a reducer by a 200-hp. motor.

At the bottom, the slope belt is fed from a surge hopper with a capacity of 260 tons level full. Two throats and two apron feeders move coal out of the hopper. Speed can be varied. One feeder or the other may be used, depending on quantity of coal in the bin, but not both at the same time. A third apron unit at right angles deposits coal on the belt.

Coal from the main-line belts is laid into the hopper by a shuttle conveyor with a horizontal and a hinged section. The end of the hinged section can be lowered to reduce coal drop into the hopper. Since the shuttle conveyor moves back and forth and thus receives coal at varying points, the belt is carried on cushion idlers for its entire length. Panels are served by 30-in. belt conveyors. Maximum length of the panel belts is 1,800 ft. Belt speed is 450 fpm.

Main and panel belts are interlocked and protected by roller switches and relays to stop outby units with a minimum of coasting. Pilot lines over all belts protect against roof falls. Curved counterweighted chutes to permit passage of lumps from the rear are used at panel-belt transfer points, which also are provided with paddle-operated knife switches to protect against spills. Sprays are installed at transfers on the main-line unit and are turned on and off automatically in response to coal flow by pressure switches actuated by belt load.

Moving a panel belt drive, including taking it down and mounting it in the new location, takes four men one shift, plus six to eight men a shift to put on the first section of belt, if all materials are at hand.

Belts are inspected and repaired underground, including vulcanizing. For this

purpose, a vulcanizer is kept on hand and portions of the belt are run through as necessary. The process consists of pulling from one lapped pile through the inspection and vulcanizing station and then lapping on the other side. Repairs on the bottom side are made by lapping or doubling the belt back to bring that side to the top.

One effect of belt transportation and fast extraction at Pleasant View is a low figure for service labor (McG-H Digest, Sept, '50, p58). This, coupled with high production at the face, results in high tons per man. Service-labor output averages 27-28 tons per man.—Coal Age, Nov, p68

Convention Calendar

(Equipment Exhibited)

Jan 15-18—Plant Maintenance Show, Cleveland, Ohio.
Jan 22-26—Tenth International Heating and Ventilating Exposition, Philadelphia, Pa.
Apr 16-18—Conference of American Society of Lubricating Engineers, Boston, Mass.
Apr 17-21—National Packaging Exposition and Conference, Atlantic City, N. J.
Apr 30-May 4—National Materials Handling Exposition, Chicago, Ill.
May 14-17—American Mining Congress Convention and Exposition, Cleveland, Ohio
May 28-June 8—Canadian International Trade Fair, Toronto
Sept 10-23—International Trade Fair, Chicago, Ill.
Oct 1-5—National Metal Congress and Exposition, Detroit, Mich.
Nov 26-Dec 1—National Chemical Exposition, New York, N. Y.

To anyone interested in any of these expositions, either as a possible exhibitor or visitor, the McGraw-Hill Digest will be glad to furnish additional information.

Textile Industry's Latest Developments

Heat-Setting Machine—A new heat-setting machine for nylon and other thermoplastic fabrics has been developed by National Drying Machinery Co. The machine has six heating cylinders, each with an inner cylinder creating an annular space filled with high-boiling-point Dowtherm liquid. The liquid is agitated constantly, thus transferring heat uniformly to the outer cylinder surface. Machine will "set" 50-60 yd. per min., depending on nylon weight.

2-for-1 Twister Plies and Cables—Twisting machine built by Howe Machinery Co. does up-twisting plying and down-twisting cabling on the same machine. It consists of three twisting units, two 2-for-1 up-twisting spindles and one 2-for-1 down-twisting spindle. Joint action of plying and cabling results in a uniform twist both in the ply and the cable.

Machine Changes Feed Pressure—New boarding machine for boarding of hosiery with heated air, preboarding by steam, or a combination of both, has been developed by Turbo Machine Co. The machine was developed especially for mills where steam pressures are not dependable and the quality of the finished boarding might be affected by fluctuating steam pressures. Circulating hot air is directed at the stocking, with more air on the welt of toe to assure thorough drying.—Textile World, Nov, p117, p112, p121

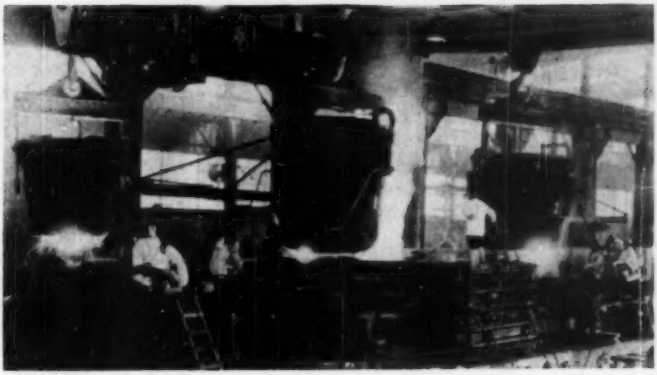
Oil Mist Lubricates, Cools

New lubricating system automatically delivers a constant stream of air-borne oil particles. Called Oil Mist, the system virtually eliminates the human factor in lubrication, drastically cuts oil consumption, and prolongs bearing life. It cools as well as lubricates.

Heart of the system, which was developed by Alemite Div. of Stewart-Warner Corp., is the lubricator. Com-

CASTS 150-TON STEEL BLOCK

A 150-ton steel anvil block for a large power hammer was cast in a single mold at Continental Foundry & Machine Co. Three openhearth furnaces melted the steel, which was poured from three ladles. Sand mold included elaborate arrangement of ten ingates. Pouring took 14½ min. after 6 wk. for making the mold.—Foundry, Nov, p150



pressed air flows first through a pressure regulator, then through the lubricator. Oil is drawn up a Venturi tube from the reservoir and is mixed with the air.

The mixture is blasted against a baffle to remove large droplets of oil and return them to the reservoir. The mist then passes into the main supply line.

Air pressure is slightly higher than atmospheric pressure. Thus, by using a filter in the system, all dust, abrasives, and other harmful matter can be eliminated.—Am Mach, Oct 30, p138

British Build Largest Dome

Built of aluminum, the dome is 342 ft. in diameter. It forms the roof of a 260-ft. dia. exhibition hall. The dome is supported on a steel ring girder about 50 ft. above ground level. This girder in turn is carried on tubular steel struts. Below the dome, and between the ring girder and the masonry wall of the exhibition hall, is an aluminum apron in the form of an inverted truncated cone that forms a sloping canopy all around the building.

Main supports of the roof are six ribs radiating from the center of the dome along great circles at an angle of 60° with each other. They are lattice girders, triangular in cross section and curved in the vertical plane.—Eng News-Rec, Oct 5, p33

Small Vibratory Ball Mill Grinds with 3,700 Balls

A vibratory ball mill developed at the U. S. National Bureau of Standards rapidly grinds cotton into particles a few microns in length. There is little or no oxidation change or contamination of the cellulose. The mill is expected to find application in grinding and blending pigments, ceramics, resins, metal powders.

Grinding is done by 3,700 steel balls colliding 100,000 times per sec. and pulverizing the material between them. A cylindrical jar, suspended by leaf springs, contains the balls.

The jar is swung in a circular path and, at the same time, is rotated slowly about its axis. The combination motion causes the collisions and prevents material being ground from settling to the bottom of the jar.

Jar motion is produced by means of a horizontal shaft connected at one end to a ¼-hp. motor and at the other end to an eccentric weight. The weight, rotating at 1,800 rpm., drives its housing and the jar holder attached to the housing in the circular path.

The ball mill in 30 min. reduced 5 g. of cotton to particles 30 microns or less in major dimension.—Prod Eng, Nov, p163

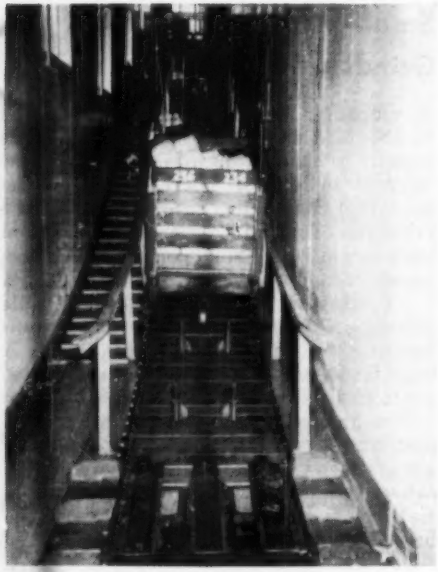
Water in Scroll Case Speeds Concreting Around Case

An improved method of pouring concrete around hydroelectric-turbine scroll cases reduces construction cost and time. The U. S. Corps of Engineers is applying the method to nine 62,500-hp. units on the Cumberland River.

The 150-ton scroll case of each unit is embedded in concrete in one pour. The pour, about 24 ft. deep, contains 1,400 cu. yd. of concrete and is made in 1 day. Total installation time now is 1 week, compared with 5 weeks for the old method.

Before the concrete is poured, the scroll case and penstock are filled with water. The water prestresses the case and shrinks it to operating temperature, thus making all corrections for elastic deformation. The scroll is also checked for water tightness.

Weight of water in the scroll opposes uplift of the concrete, thereby permitting a continuous pour without danger of floating the casing or misalignment. Water is circulated through the casing to help dissipate heat from the concrete and to prevent distortion that might otherwise be caused by changes in air temperature within the casing.—Power, Nov, p105



CARTS CONVEYED BY ESCALATOR

An escalator moving a cart of yarn from one floor to another is shown in use at Standard Knitting Mills. The cart from the conditioning room is pushed onto the three metal runners in the foreground. Fingers on the escalator track move up between the metal runners and catch a metal plate attached to the underside of the cart. At the top landing the escalator fingers move below the floor level and disengage the cart.—Textile World, Oct, p168

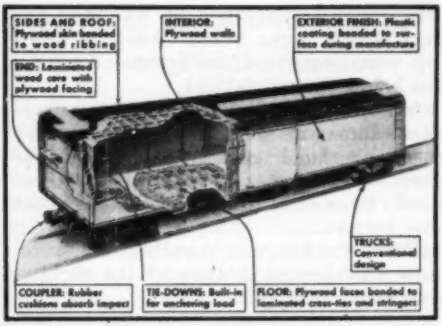
Novel Spoil Removal

When an excavation inside the building for cellar storage bins was required at Springs Cotton Mills, the contractor used a portable conveyor to take dirt from inside the plant and load it on trucks outside.

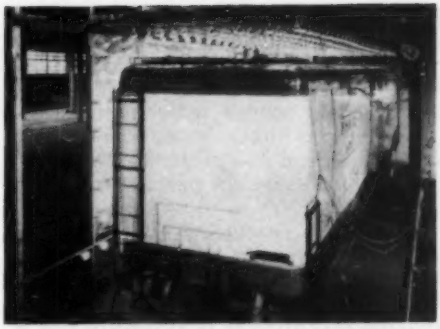
First, two small access pits were dug to grade on either side of one building wall, then connected beneath the grade beam. The conveyor, placed in the slot thus formed, loaded out hand-excavated material as it was dumped down the inside hole.—Const Meth & Equip, Oct, p51

Cast Whole Airplane Wings

Practicability of casting entire airplane wings of magnesium alloy will be determined by Northrop Aircraft, Inc. The outer half of a wing will be cast in one piece. Tests will then compare its characteristics with a similar wing made from aluminum sheet and extrusions by conventional fabrication methods. If the project is successful, less time and equipment will be needed to expand production of the cast structures than would be needed for riveted structures.—Foundry, Oct, p150


SIDES AND ROOF: Plywood skin bonded to wood ribbing
INTERIOR: Plywood walls
EXTERIOR FINISH: Plastic coating bonded to surface during manufacture
END: Laminated wood core with plywood facing
TRUCKS: Conventional design
COUPLER: Rubber cushions absorb impact
TIE-DOWNS: Built-in for anchoring load
FLOOR: Plywood faces bonded to laminated cross-ties and stringers

NEWEST FREIGHT CAR is made of wood electronically bonded to form a unit structure



EXTERIOR FINISH of Unicel is "molded-on" during fabrication, requires no repainting

New Design Wooden Freight Car

Laminated wood and a minimum of steel make this freight car a radical departure from the traditional design using steel that is scarce now

AIRCRAFT-TYPE DESIGN has reached the freight-car field in a radical departure from tradition. The Unicel, built by Pressed Steel Car Co., is a combination freight-refrigerator car without a frame and is built with an absolute minimum of steel. It promises economies in manufacture, operation, and maintenance.

The new car is made mostly of plywood—bonded and shaped with electronic high-frequency heat and special plastic resins. Its molded structure is stronger than a steel freight car. Reason: Pressed Steel Car Co. engineers built the car on aircraft-engineering principles.

For years, freight cars were built with a steel center sill, like the keel of a ship. On this was set a framework of steel covered with wood or steel. Ends and roofs were added as separate parts. The finished car was heavy, cumbersome, expensive to haul, and expensive to maintain. The center still took all the impacts, giving the whole car a beating.

In the new car, the entire structure becomes in effect the center sill. The one-piece car is actually a hollow beam that carries itself. Pressed Steel Car Co. engineers use "stressed skin" design—an airplane principle. Thin sheets can carry load if they are kept from buckling. The sheets cannot buckle if they are attached to each side of a lightweight core. In Unicel, the skin is bonded permanently to the core, without rivets or other mechanical fastening.

Railroads and shippers will gain these significant advantages:

- The car is lighter, uses 20 tons less steel.
- The new car is stronger than a comparable steel car, even though it is built of wood. Under test it showed considerably more impact strength than a conventional car.
- The car requires fewer manhours to build. It can be built for knock-down assembly, shipped overseas.
- The car costs less than a conventional freight car. It is estimated that 1,200 Unicels can be bought for the same price as 1,000 regular freight cars.
- As a freight car, Unicel has 4,630 cu. ft. useable capacity, compared with 3,715 cu. ft. in a conventional car.
- A series of tests has shown that the

Unicel has high thermal efficiency. The car has "cold-wall" construction.

The basic raw material for the car is wood, in both block and plywood form. The wood is bonded with specially developed resins that "set up" under heat as they are held in a press. It is possible, therefore, to shape the part as it is being bonded.

The bonding technique is simple (Mc G-H Digest, Dec, '50, p18). The materials are placed between electrodes in a hydraulic press. Pressure runs between 150 and 200 psi., and the temperature rise is 200° F. Curved sections are handled in curved molds.

Plastic coatings for the outside of the car can be bonded during the same processing. In one operation, face, core, impervious weathering films, and "painting" are bonded together. The finished car never needs repaint; it only requires washing occasionally with a detergent.—Business Wk, Oct 21, p76

Wider Use for Hydrazine

Hydrazine (N_2H_4) first reached prominence as a fuel for jet engines (McG-H Digest, Dec '50, p37). Now its applications are spreading.

It is the basis for many new insecticides and herbicides. One compound slows the growth of grass. Another is used to prepare a new antitubercular drug. Still others are applied to silvering mirrors, blowing foam rubber, making new plastics and disinfectants, crease-proofing textiles, and stabilizing fats.—Oil & Gas J, Nov 2, p54

Ducts Help Bus Ventilation

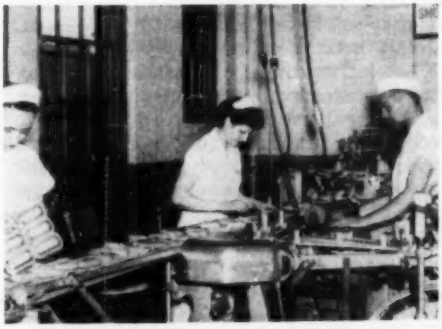
Experiments have been under way at Houston, Texas, to determine how to reduce temperatures inside a bus without mechanical air conditioning. In one case an opening was made just above the upper edge of the windshield. Since the windshield on this particular bus slopes backward, the effect was to "crowd" air striking the windshield up and into the duct which began there. Another opening was located on the front end of the bus below the windshield.

Air moving backward along the overhead duct was passed into the bus by three overhead grilles. Air from the lower opening passes backward at seat level. Even at moderate speeds the effect was noticeable.

When the bus was standing still, automatic fans forced air through the ducts.—Am Auto, Nov, p45

Forging Speeds Wing Output

Revolutionary new forging process is under development by U. S. Air Force, Lockheed Aircraft Corp., and Wyman-Gordon Co. It utilizes specially designed dies and a vertical hydraulic press to forge ½-in. thick integrally-stiffened wing skins, thus eliminating entirely the need for riveted reinforcements. It also cuts material loss from machining to less than one-half of 1%.—Steel, Oct 30, p66



LOW-COST PIE PACKAGING

Changing by intermediate steps from laborious hand packing to this tray-forming and wrapping machine has permitted Wagner Baking Corp again to offer a 5¢ pie. The machine cuts, forms, and imprints a boat from roll-fed, waxed cardboard paper. From the marker, printed boats are ejected to chain-belt conveyor where girls fill them with pies. Boats then are wrapped with unprinted cellophane, heat-sealed, and placed in cartons.—Food Ind, Nov, p56

New Uses for Wollastonite, Latest Industrial Mineral

Wollastonite is a calcium metasilicate, white in color, with a hardness of 4.5 to 5. It is brittle with a fibrous cleavage. It commonly occurs as a metamorphic mineral associated with garnet in metamorphosed limestones.

Until recently, wollastonite was used only on an experimental scale. Now a commercial plant in New York State will produce industrial wollastonite products. Here are some of its latest applications:

▶ When milled to a fibrous, cottony aggregate, it has special filler and filter applications.

▶ In coated paper, a blend of wet ground wollastonite and kaolin upgrades the clay and permits a cheaper clay to be used.

▶ As an additive to concrete, it greatly increases the strength of portland cement.

▶ It is three times as effective as agricultural limestone when used as a soil additive.

▶ By special processing, a particle size of 20-50 millimicrons is obtained that has demonstrated superiority over paper clay as a paper filler.

▶ When mixed with glass cullet and bentonite and fired, it has high strength and resistance to shock. It can be sawed, and it can be drilled with an ordinary drill. Nails may be hammered into it without cracking or splitting it.—Eng & Min J, Nov, p95

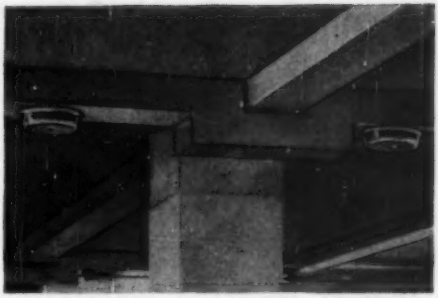
New-Type Permanent Molds

Practical method of making permanent molds has been developed by Northrop Aircraft, Inc. It consists of spraying metal onto a structure or pattern, then removing the sprayed metal shell with a suitable backing material to act as reinforcing.

Sprayed-metal molds are made in several ways. For simple shapes, steel templets may act as guides with intervening spaces faired in with plaster. Steel wool is distributed into the plaster, which is coated with a heat-resistant water-proofing coating of metal powder and a bond.

A metal coating is then sprayed over this pattern to ¼-in. thickness. Reinforcing is added, and a backing material of plaster or low-melting-point metal is poured in place to complete the mold.

For more complicated shapes, pattern-making methods are modified as required. —Iron Age, Sept 28, p82



HIGH-VELOCITY AIR DIFFUSERS

New air-conditioning system at Pittsburgh's Kaufmann Dept. stores has central conditioning unit in penthouse and uses two elevator shafts for vertical ducts. At ceiling level, air is carried at 30 mph. through small, shallow ducts to 3,500 air diffusers. Each diffuser discharges 90-180 cfm. over 150-sq. ft. area at 2,400 fpm. System is first to use such high velocity for large interior zones.—Power, Nov, p99

Aerosol Products Popular

Aerosol dispensers sell their products because of convenience. Insecticides, room deodorants, waxes, fire extinguishers, paints, spotting agents, sunburn lotions, and personal deodorants are now being joined by hair shampoos and shaving cream. No work—just push a button and out comes the lather. On its way also is a nose and throat spray to relieve congestion caused by colds.—Chem Ind, Sept, p378

Catalyst Does Double Duty in Lube Plant, Cat Cracker

Dual use of natural-clay catalyst for both lubricating-oil treating and subsequent fluid catalytic cracking is now a successful operation in two Sinclair Refining Co. plants. The new technique reduces operating costs.

Fresh clay decolorizes neutrals and other lube stocks in one plant. Then it is moved by railroad to another plant where it is charged as fresh makeup catalyst to a modern fluid catalytic cracking unit.

Shipping the clay presented some problems. Slurrying the clay before shipment was unsatisfactory because of separation in the tank car. It is shipped in a two-compartment car; one compartment is charged with washed, steam-dried clay direct from the discard filter, and the other with clay further dried in a burner setup at the lube plant.

On arrival at the second plant, contents of both compartments are dumped into a small pit, slurried, and pumped to the reactor of the catalytic cracking unit. —Oil & Gas J, Oct 19, p78

Chemical Directory

Of considerable interest and value to overseas buyers of specialized American chemicals will be the new McGraw-Hill Directory of Chemicals and Producers. It offers a complete up-to-date listing of chemical raw materials, industrial chemicals, fine chemicals, and dyestuffs.

A major innovation is separate listings for various grades of chemicals. The book also gives necessary commercial shipping data, including form, shipping label, packing, and shipping point.

The directory, priced at $20, is published by McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y., U.S.A.

Steps Up Testing Voltage

Standard practice in ground testing repaired motors is to apply twice the rated voltage plus 1,000 volts. This requires that repair shops have means of obtaining various voltage steps.

At Roy A. Berentz Co. in Houston, a 1-kva., 110/12,000-volt, single-phase transformer supplies testing power. To get the desired voltage steps, a water potentiometer is installed in the low-voltage circuit of the transformer. Turning a handwheel varies voltage from zero to 12,000 volts.

The potentiometer consists of two plastic jars, each 6 in. in dia. and 14 in. high. At the bottom of each jar is a stationary copper plate connected to 110-volt circuit, and about two-thirds the way up each jar is a copper band with a tie-cable connecting both bands. Both jars are filled with water.

Each jar also has a movable copper plate connected to a common cross-bar for raising and lowering with the handwheel and thereby increasing or decreasing the resistance.—Elec C&M, Nov, p61

Sheet Titanium Announced

High-strength sheet titanium is now commercially available for the first time. The new sheet, made by Rem-Cru Titanium, Inc., has a minimum yield strength of 130,000 psi. It can be readily rolled and has good formability. It requires a bend radius of only 1½-3 times thickness, depending on rolling temperature and reductions taken.

The sheet, known as RC-130-A, is a binary 7% manganese-titanium alloy. The manganese stabilizes a considerable amount of the beta phase and strengthens both alpha and beta phases.—Iron Age, Sept 14, p85

British Productivity Gains at Highly Satisfactory Rate

Productivity in Britain in the last 2 years has risen healthily. Estimates of 6 to 9% per year are considered accurate.

The part that the Anglo-American Council plays cannot be determined closely. But reports indicate that many new methods adopted and much new machinery installed can be attributed to the council's activities.

The main feature of the council's work has been the dispatch of industry and specialist teams from Britain to the U. S. to study American methods. Each team, after touring its own home industry, spends 6 weeks visiting plants in the U. S. Then it prepares a report on its findings that is widely distributed throughout its industry.

Up to the third session of the council, held in London in October, reports had been published by 15 teams. Over 30 teams have visited the U. S., and reports are in preparation. More visits are planned.—Mach, Oct 28, p1561

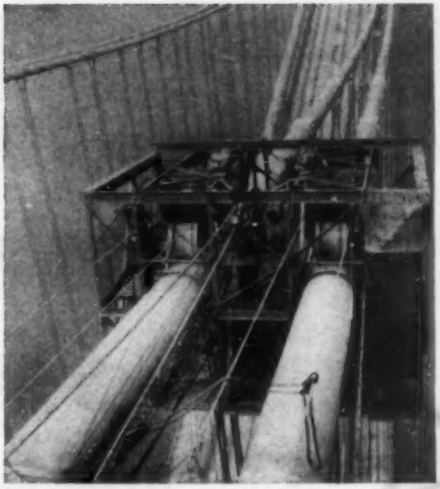
Pegs Help Fix Let-Off Teeth

If there is too much tension on a warp in a loom with a gear let-off, flange-gear teeth are sometimes broken.

In order to run the warp out, the beam should be moved to the rear position and the let-off pinion disengaged. Then the broken teeth can be repaired in this manner:

Remainder of the broken tooth is cut away. Two holes are then drilled and tapped side-by-side at each broken tooth position. Diameter of the holes is equal to the tooth thickness. Steel pegs with same height as unbroken tooth and threaded at one end are screwed into the holes. The tops of the pegs are shaped to mesh with the let-off pinion.

The warp is then moved back into position, and the loom started up.—Textile World, Nov, p194



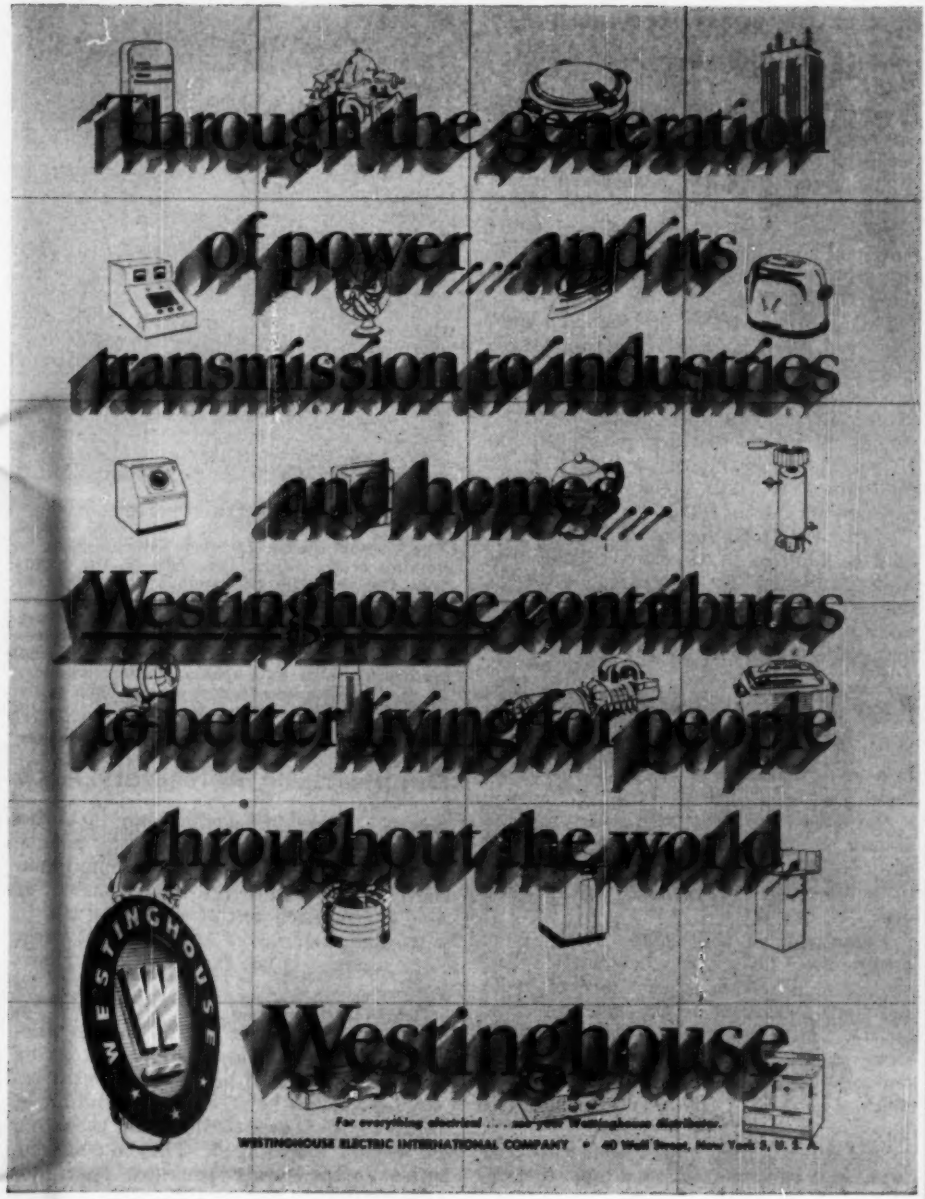
CAGE HELPS TIGHTEN BOLTS

The 10-ton aluminum cage shown here is helping crews adjust the bolts on the bands that transmit the tremendous weight of the George Washington Bridge from the suspenders to the main cables. Made from aluminum sections and fitted with rubber-shoed rollers, the two-level cage is winched up along the parallel cables. Two crews work in the double-decked cage, one on each cable. —Const Meth & Equip, Nov, p42

Double-Hung Refractory Arch

Recently developed double-hung insulated refractory arch incorporates the pendulum-hung feature that permits maximum movement without tile replacement. It also causes each belt of supported tile to self-align themselves and to resist pressure against outer framework or skewbacks.

Each unit of arch tiles is movable, being suspended from a tube that is supported from the over-head framework by adjustable I- or U-bolts. Horizontal refractory S-lock between upper and lower refractories prevents tiles from becoming outwardly disengaged. They do not require compensating pressure from adjacent tiles.—Steel, Oct 23, p86


Through the generation
of power and its
transmission to industries
and homes
Westinghouse contributes
to better living for people
throughout the world
Westinghouse
For everything electrical . . . ask your Westinghouse distributor.
WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY • 40 Wall Street, New York 5, U. S. A.

Production Ideas

from Manufacturers' Catalogs

1-1 Refractories—General Refractories Co. 272 p. "Refractories" is a complete discussion of brick, high-temperature mortars, plastics, castables, and bulk products, useful for those who design, use, purchase, construct, and supervise the operation of equipment requiring refractory materials.

1-2 Engineering Services—E. J. Longyear Co. 21 p. An outline of services and equipment supplied in the appraisal, exploration, development, and operation of mineral resources is found in pamphlet 602.

1-3 Industrial Control Devices—Minneapolis-Honeywell Regulator Co., Brown Instruments Div. 64 p. Catalog 8303 presents non-indicating electric, electronic, and pneumatic controllers that have many industrial applications.

1-4 Propellers for Turbo-prop Engines—Curtiss-Wright Corp., Propeller Div. 20 p. The advanced series of subsonic, trans-sonic, and supersonic propellers driven by gas turbines are discussed in pamphlet 1M-1008.

1-5 Molding Machines—Reed-Prentice Corp. 20 p. Examples of products made on plastic injection molding machines is contained in first bulletin. Second describes machines and molds.

1-6 Cold Steep Bleaching—Buffalo Electro-Chemical Co. Inc. 16 p. Full details are given of the equipment, chemicals, and methods for treating of groundwoods, unbleached sulphites, neutral sulphites, semi-chemicals, and krafts in "Becco Cold Steep Bleaching Process".

1-7 Versatile Fork-lift Truck—Lull Mfg. Co. 12 p. Bulletin AD-30A describes a materials-handling device that features a straight line pick-up, carry, and delivery.

1-8 Industrial Chemicals—Columbia Chemical Div., Pittsburgh Plate Glass Co. 24 p. A description of chemicals available to industry is given in bulletin A-950.

1-9 Railway Cars and Equipment—Pressed Steel Car Co., Inc. 190 p. Catalog 72 covers railway cars and car parts, and industrial track and track accessories.

1-10 Mining Cables—Okonite Co. 72 p. Two mine system diagrams showing electrical cables recommended for every mining application plus descriptive and technical data are found in bulletin H-433.

1-11 Spun-end Tubes—Wolverine Tube Div., Calumet & Hecla Consolidated Copper Co. 28 p. Booklet BP-10M-750 describes spun one-piece tubular parts.

1-12 Storage-battery Data—ESB International Corp., Exide Div. 20 p. Replacement data is available in Hand-Book Section 20-1 for 1938-1949 storage-battery models.

1-13 Shaft Packing—Greene, Tweed & Co. 20 p. Catalog PC-101 describes application, structure, and performance of packing.

1-14 Industrial Hose—Weatherhead Co. 20 p. Flexible hose and steel reuseable hose ends for every industrial application are described in catalog H-1451.

1-15 Precision Boring and Milling—De Vlieg Machine Co. 20 p. JIGMIL catalog describes machines capable of boring and milling to 0.0001 in. with high productivity and little operator skill.

1-16 Multi-stage Centrifugal Pumps—Ingersoll-Rand Co. 16 p. Pumps for high-pressure applications to 1,200 psi. and capacities to 1,600 gpm. are detailed in pamphlet 7233.

1-17 Steel Derricks—American Hoist & Derrick Co. 36 p. Six different types of derricks and their specifications are treated in catalog 200-D-3.

1-18 Increase Welding Speed—Lincoln Electric Co. 48 p. Bulletin 444 is written to assist arc welders in establishing proper welding procedures and procedure control.

1-19 Lubricating Greases—Shell Oil Co. 40 p. The fundamentals of lubricating greases and their application are discussed in "Panorama of Lubrication" Vol. 1 No. 11.

1-20 Mulled Sand for Foundries—Beardsley & Piper Div., Pettibone Mulliken Corp. 36 p. The advantages of mulled sand is discussed in catalog 1220.

1-21 Tenite Specifications—Tennessee Eastman Corp. 44 p. Complete data on types, properties, processing, and applications of plastic is found in "Tenite Specifications".

1-22 Flat Surface Grinding—Blanchard Machine Co. 86 p. Booklet 281-10M750 presents

Production Ideas (Cont.)

typical examples of machining and finishing of flat surfaces by grinding.

1-23 Earthmoving Equipment—Thew Shovel Co. 28 p. Two pamphlets, 15535-D and 1453219, contain design and construction information on crawler and self-propelled power shovels.

1-24 Can-making Machinery — Max Ams Machine Co. 16 p. A description of the facilities available to the can-making industry is found in "New Wings".

1-25 Carbide-tipped Tools — Whitman & Barnes Div., United Drill and Tool Corp. 24 p. Twist drills, reamers, interchangeable punches, countersinks, and special tools are listed in catalog 104.

1-26 Honing Apparatus—Micromatic Hone Corp. 12 p. Catalog AR-115 describes the surface finishes produced by honing machines.

1-27 Latest Finishes—Airco Co. International. 16 p. Information on a new lacquer resin and two new alkyd resins for use in wall finishes is given in "Tomorrow's Finishes Today".

1-28 Industrial V-belts—Durkee-Atwood Co. 40 p. How to design and select V-belt drives is given in bulletin D-161.

1-29 Electrical System Planning—Anaconda Wire & Cable Co. 52 p. Information on how to design and maintain an electrical system plus useful data tables and charts are found in booklet C-87.

1-30 Heavy Industrial Equipment — Posey Iron Works, Inc. 12 p. Discussion of company's production and engineering facilities is complete in "The Posey Iron Works, Inc."

1-31 Roll Grinders—Farrel-Birmingham Co. 16 p. Bulletin 118 contains information about two-wheel, swing-rest roll grinders for roll maintenance in the paper industry.

1-32 Welded Steel Tubing—Armco Steel Corp. 16 p. What welded steel tubing is, what it offers you, and how to use it is found in bulletin 1450 7M DP 5-50.

1-33 Warp Stop—Draper Corp., K-A Electrical Warp Stop Div. 16 p. "Electrical Warp Stop Motion" details a warp stop device that can be applied to all types of looms running all kinds of fabrics.

1-34 Crushing and Screening Plants—Iowa Mfg. Co. 54 p. Complete description of aggregate-handling equipment and bituminous mixing equipment is found in bulletin ECE-3.

1-35 Materials Handling—Towmotor Corp. 20 p. Three pamphlets, SP-6, SP-7, and F2 describe new devices and their applications and short-cuts to low-cost handling.

1-36 Internal Combustion Engines—General Motors Corp. 152 p. Illustrated introduction to the diesel and gasoline engines is given in two booklets: "A Power Primer" and "Diesel The Modern Power". They may also be obtained from nearest General Motors Overseas Operations office.

1-37 Centrifugal Pumps — Worthington Pump & Machinery Corp. 20 p. Specifications, ratings, and dimensions of 10-1,600 gpm. pumps is given in bulletin W-306-B1.

1-38 Measures Surface Roughness—Physicists Research Co. 22p. A discussion of the basic tool for quality control involving surface roughness is found in the catalog.

COPIES of these manufacturers' catalogs will be sent free to subscribers. Fill in squares with catalog numbers desired and mail to the Editor, McGraw-Hill Digest, 330 W. 42nd St., New York 18, N. Y., U. S. A.

Not good after April 1, 1951. (This coupon MUST be completely filled in. Please TYPE or PRINT.)

Name .....

Title .....

Company .....

Address .....

.....

UP goes production
Down come your costs
with Remington Rand
"KNOW-HOW"

This "Know-how" Service is available in principal cities of the world.

The chief reason that Remington Rand "Know-how" Service cuts costs: its many practical systems help you do *more* work in *less* time, by giving the facts you need for decisions promptly...accurately...in concise, usable form. These savings can help put you far ahead of competition. Investigate them today.

Production Control

Kardex Visible raises production schedules in many ways. It *coordinates* all the factors—parts, supplies, raw materials, due dates—that contribute towards balanced production and economical use of machines. It eliminates waste motion . . helps you keep delivery promises too!

Accounts Receivable Control

For Your Accounts Receivable: Kardex, a Visible System, is a great time-saver. It enables one operator to handle *all* postings, credits and collections on thousands of accounts. It shows at a glance which accounts are overdue...gets the money in on time with a minimum of effort.

Remington Rand "Know-how" Service also for:

- Purchasing
- Personnel
- Sales
- Inventory

SEND THIS COUPON TODAY FOR MORE INFORMATION

Remington Rand Inc., EXPORT DIVISION, DEPT. E25, 315 FOURTH AVE., NEW YORK 10, U.S.A.

Please give me the details about your *"know-how"* service on control of:_____

NAME_____

COMPANY_____

ADDRESS_____

CITY AND COUNTRY_____

ADVERTISERS IN THIS ISSUE

ALLIS-CHALMERS MANUFACTURING CO... 2
Compton Advertising, Inc.

AMERICAN CYANAMID CO..... 1
Hazard Advertising Co.

BLISS CO., E. W..... 8
Fred Wittner Adv.

DOW CHEMICAL OF CANADA, LIMITED.... 11
Harold F. Stanfield Ltd.

ELECTRIC AUTO-LITE CO.....3rd Cover
National Export Advertising Service Inc.

EX-CELL-O CORPORATION..... 15
Holden, Clifford, Flint Inc.

GOVERNMENT OF CANADA..... 68
Walsh Adv. Co., Ltd.

HARSHAW CHEMICAL CO..... 4

INTERNATIONAL GENERAL ELECTRIC CO.. 12
Grant Advertising, Inc.

INTERNATIONAL HARVESTER EXPORT CO.. 7
McCann-Erickson Corp.

McGRAW-HILL BOOK CO..... 67

MONSANTO CHEMICAL CO.....4th Cover
Gardner Advertising Co.

NORDBERG MANUFACTURING CO...2nd Cover
Russell T. Gray, Inc.

REMINGTON RAND, INC..... 65
Leeford Advertising Agency, Inc.

STANDARD OIL COMPANY (NEW JERSEY).. 16
Foreign Advertising & Service Bureau, Inc.

WESTINGHOUSE ELECTRIC INT'L CO.....5, 62
National Export Adv. Service

YODER COMPANY..... 6
G. M. Basford Co.

Publications Digested:

McGraw-Hill Publishing Co. Inc., 330 W. 42nd St., New York 18, N. Y.
American Machinist • Aviation Week • Bus Transportation • Business Week • Chemical Engineering • Chemical Industries • Coal Age • Construction Methods & Equipment • Electrical Construction & Maintenance • Electrical Merchandising • Electrical West • Electrical Wholesaling • Electrical World • Electronics • Engineering & Mining Journal • E & M J Mineral & Metal Markets • Engineering News-Record • Factory Management and Maintenance • Fleet Owner • Food Industries • Industrial Distribution • Machinist (London Office) • Nucleonics • Operating Engineer • Pharmacy International • Power • Product Engineering • Textile World • The American Automobile (Overseas Edition) • The Welding Engineer

Chilton Company, Chestnut and 56th St., Philadelphia 39, Pa.
Automotive Industries • Boot & Shoe Recorder • Commercial Car Journal • Department Store Economist • Distribution Age • Hardware Age • Hardware World • Motor Age • The Iron Age • The Jewelers' Circular-Keystone • The Optical Journal & Review of Optometry • The Spectator

Dartnell Publications, Inc., 4660 Ravenswood Ave., Chicago 40, Ill.
American Business

Fritz Publications, Inc., 59 East Van Buren St., Chicago 3, Ill.
The Paper Industry

Industrial Publications, Inc., 5 South Wabash Ave., Chicago 3, Ill.
Ceramic Industry

Modern Packaging Corp., 122 E. 42nd St., New York 17, N. Y.
Modern Packaging

Modern Plastics, Inc., 122 E. 42nd St., New York 17, New York
Modern Plastics

Petroleum Publishing Co., 211 S. Cheyenne Ave., Tulsa 1, Okla.
The Oil and Gas Journal

Simmons-Boardman Publishing Corp., 30 Church St., New York 17, N. Y.
American Builder • Marine Engineering & Shipping Review • Railway Age • Railway Engineering & Maintenance • Railway Mechanical & Electrical Engineer • Railway Signaling & Communications

The Penton Publishing Co., Penton Building, Cleveland 13, Ohio
Steel • The Foundry

McGraw-Hill World News Bureaus: London, Paris, Frankfurt, Tokyo, Bombay, Melbourne, Mexico City, Rio de Janeiro, Stockholm, and 60 other industrial cities.

5 Timely McGRAW-HILL BOOKS

SMALL PLANT MANAGEMENT

Sponsored by the American Society of Mechanical Engineers' Small Plant Committee; edited by Dr. EDWARD H. HEMPEL, Graduate Faculty, Brooklyn Polytechnic Institute. September, 1950. 548 pages, $6.00

Based on a systematic study of small plant activities in different industries, this book is designed to fill the need for up-to-date, practical knowledge of management techniques especially suited for application in small plants or technical service units. It shows how management may be developed with a maximum of effectiveness and a minimum of management apparatus; that is, how a maximum of work at a minimum of cost per unit may be obtained. This volume offers improved procedures in planning, organizing, operating, supervising, and controls; the newest and most effective methods have been described and illustrated. The treatment is clear and concise, and the arrangement is logical, chapters being grouped in the following sections: Part I, Small Plants as Economic Factors; Part II, Management Tasks; Part III, How to Solve the Important Problems of Small Plant Management; and Part IV, Small Plant Future.

INTRODUCTION TO SALES MANAGEMENT, New Third Edition

By HARRY R. TOSDAL, Professor of Business Administration, Graduate School of Business Administration. George F. Baker Foundation, Harvard University. *Harvard Problem Books.* September, 1950. 629 pages, $5.50.

The plan of this modern revision of an exceptional text consists of cases and brief textual statements of general principles, followed by groups of carefully selected longer problems serving as a basis for study and thought. Supplementing this presentation is a series of brief cases which are intended to bring up problems in the same general field but under varying conditions and for different industries. In addition, a further series of questions is included, designed to provoke thought and discussion upon the practical, technical, social, and economic aspects of sales management. The transition from a seller's market to a buyer's market which characterized generally the postwar period is reflected in the selection of problems included in this new edition.

THE TECHNIQUE OF EXECUTIVE LEADERSHIP

By JAMES F. BENDER. September, 1950. 272 pages, $3.50

This useful, informative book has been written as a guide and self-training course for everyone who wants to get to the top. It points up the ten most important factors for developing and maintaining leadership in the modern business world. Dr. Bender tells the reader how to analyze himself, streamline his mind, be a pleasure to work with, grow as a speaker, improve his reading habits, master the interview, conduct excellent conferences, be a good psychologist, get the most out of his physique, and stay tuned to modern leadership. The important emphasis is on specific information, facts, and things to do.

GERMAN-ENGLISH TECHNICAL AND ENGINEERING DICTIONARY

By LOUIS DeVRIES, Professor of Modern Languages, Iowa State College. September, 1950. 928 pages, $20.00

This dictionary, by the author of the successful *French-English Science Dictionary* and *German-English Science Dictionary*, reflects the revolutionary advances in engineering and technology and the many resultant additions to technical nomenclature during the last ten years. The subjects covered include: Aeronautical Engineering (Aviation, Meteorology). Chemical Engineering and Chemical Technology (Rubber, Plastics). Civil Engineering (Railways, Navigation, Docks and Harbors, Roads, Soil Mechanics, Hydraulics, including Mathematics). Electrical Engineering (Radio, Acoustics, Optics, Television, Communications, Electronics, Radar, including Physics). Mechanical Engineering (Diesel Engines, Jet Propulsion, Machine Parts, Metallurgy). Mining Engineering (Mineralogy, including Geology). Industries (Aluminum, Automobile, Motion Picture, Petroleum, Iron and Steel, Paper, Sugar, Textile, including Patents).

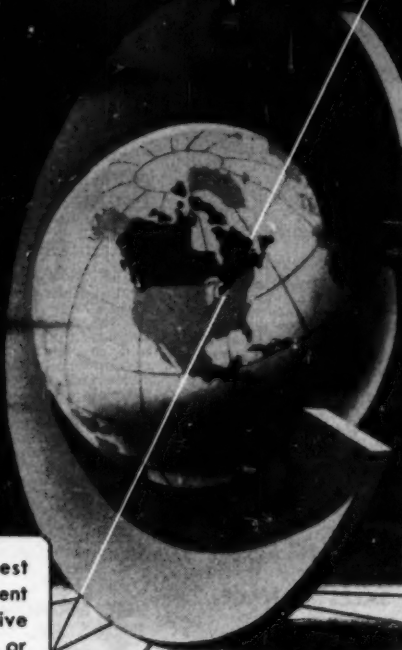
THE ECONOMICS OF AMERICAN INDUSTRY, New Second Edition

By EVAN B. ALDERFER, Lecturer in Industry, and H. E. MICHL, former member of the Industry Department, University of Pennsylvania. November, 1950. 714 pages, $5.50

The principal aim of this thorough revision of a successful book is to appraise and interpret the recent developments in our industrial structure. For each industry the latest available information has been incorporated to indicate changes in industrial capacity, shifts in location, and the development of new industrial areas and additional manufacturing facilities. Special emphasis has been given to outstanding technological developments in leading industries such as steel, aluminum, petroleum, rubber, and chemicals. The integration movement in the textile industries is comprehensively analyzed. In the case of industries especially sensitive to foreign competition, there is consideration of the effects of war on the international position of American industry, and a discussion of the impact of tariff reductions made under the Trade Agreements Act.

McGRAW-HILL Book Co. 330 West 42nd Street, New York 18, N. Y., U.S.A.

There's something for YOU...



Consult your nearest Canadian Government Trade Representative for full information, or write direct to The Administrator, Canadian International Trade Fair, Toronto, Canada.

Both for buying and for selling, Canada is one of the world's great markets.

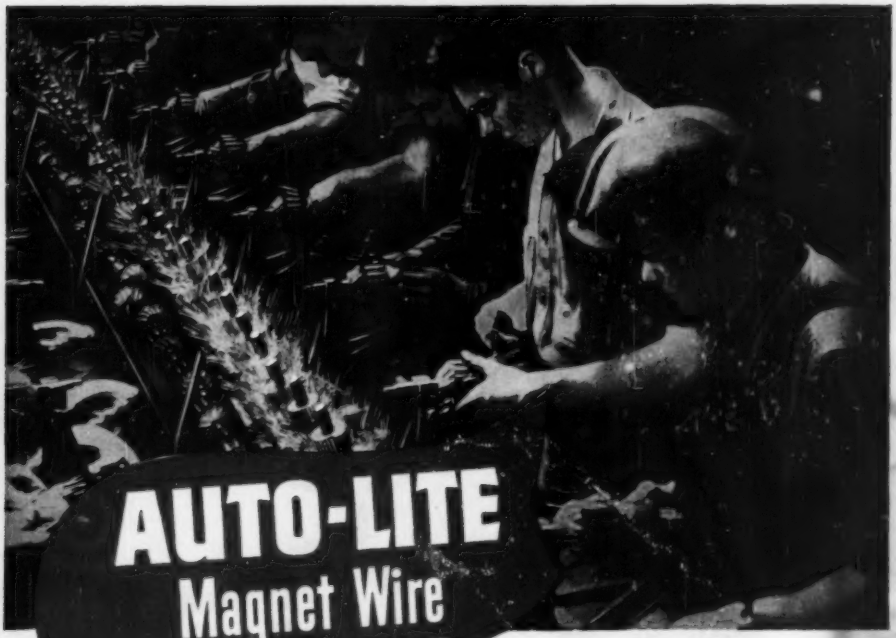
AT THE CANADIAN INTERNATIONAL TRADE FAIR

TORONTO MAY 28 – JUNE 8, 1951

DEDICATED TO THE PROMOTION OF INTERNATIONAL TRADE BY

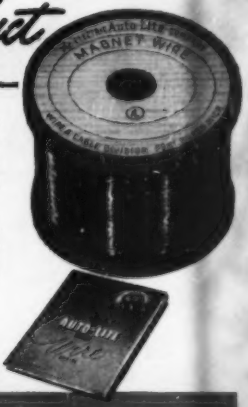
THE GOVERNMENT OF CANADA

51-11E



AUTO-LITE
Magnet Wire

Engineered to fit your product



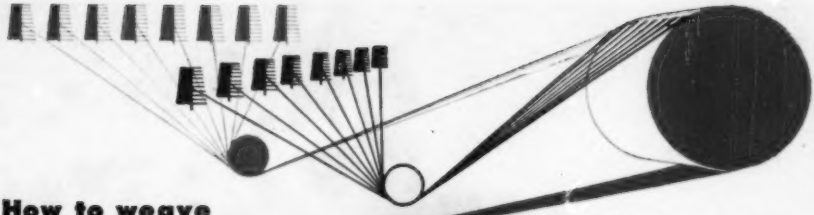
You'll find that Auto-Lite has the answer to all your Magnet Wire problems. Quality wire of every shape, size, type and insulation can be had to meet your requirements. Auto-Lite engineering know-how, research and long experience have built Auto-Lite's world-wide reputation for fine products.

Auto-Lite's Magnet Wire Catalog, packed with useful information, technical specifications, simplified charts and other useful data is now available. Executives and engineers should have this valuable catalog for ready reference.

Write on your company letterhead to:

THE ELECTRIC AUTO-LITE COMPANY
Export Division, Dept. 15: Chrysler Building, New York 17, N. Y., U.S.A.

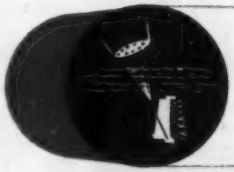
AUTO-LITE MAGNET WIRE



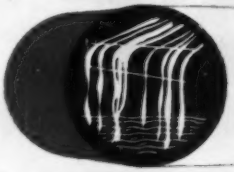
How to weave profits into TEXTILES

DESIRES FOR FINER and more serviceable fabrics are increasing constantly . . . and the task of weaving fabrics of lasting beauty and usefulness becomes more and more difficult for textile manufacturers everywhere. Many of the world's leading mills are solving the problem through chemistry. Monsanto has much to offer the textile industry in its search for better processing, for better materials and lower production costs.

Monsanto Syton* controls fiber slippage in spinning and increases tensile strength in woolens and worsted yarns. Plumper, softer, more uniform yarns result. Production rates are increased.



Monsanto's Stymer* binds the yarn filaments and provides the abrasion resistance and strength needed in high-speed weaving of filament acetate and viscose.



Santomerse* No. 1—Cost advantages in cleaning, scouring, wetting and re-wetting result from the use of Santomerse No. 1—the all-purpose wetting agent.

Resloom*s—Monsanto's melamine-formaldehyde textile resins help fabrics retain their new appearance, since they become part of the fabrics during processing. Resloom*s control shrinkage and contribute washability and wrinkle resistance to cottons, woolens and rayons.

**Trade-mark registered.*

MONSANTO CHEMICAL COMPANY, *St. Louis 4, Missouri, U. S. A.* • MONSANTO CHEMICALS LTD., *London* • Monsanto (Canada) Ltd., *Montreal* • Monsanto Chemicals (Australia) Ltd., *Melbourne* • Monsanto Chemicals of India, Ltd., *Bombay*. Representatives in principal cities.

MONSANTO
CHEMICALS FOR PLASTICS

Serving Industry . . .
Which Serves Mankind